RESEARCH WING
TAMILNADU FOREST DEPARTMENT

ANNUAL RESEARCH REPORT

TAMILNADU FORESTRY RESEARCH

Chief Conservator of Forests and Director
31 AUG 2006
TNFA, CBE-641 002

2004 - 2005

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RESEARCH WING - TAMIL NADU FOREST DEPARTMENT

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Annual Research Report
2004 - 2005

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Research Wing
Tamil Nadu Forest Department
Government of Tamil Nadu
Chennai

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Dr. Sukh Dev, I.F.S.,
The Principal Chief Conservator of Forests,
Chennai - 600 015.

FOREWARD

In the international scenario, the role of forests in mitigating adverse effects of environmental degradation and overall effect in ameliorating the quality of air and water is being progressively recognized. One of the paradoxes of the modern civilization is that though the people live away from the forests, their dependencies on the forest products for their needs, comforts, welfare etc., have increased. At this juncture, the need for Forestry Research to intervene and evolve appropriate solutions becomes need of the hour.

In Tamil Nadu, Forestry Research started from 1918. Till 1980s, Research concentrated mainly on production of raw materials, site preparation, conservation of forest resources, tree improvement, involving vegetative propagation, germplasm banks, clonal seed orchards etc. In late 1990s, the concept of organic farming with application of bio fertilizers was given importance. In 2001, new innovations were evolved in the field of post harvest technology. In 2004-05, research was concentarted in secondary timbers, veneer production, afforestation programmes, agro forestry, seed orchards, introduction of new exotic species like Kaya antotheca, economically important species like Caesalpinea sappan, new Eucalyptus species, aromatic species like Meleleuca alternifolia, Tamarind clones from Andhra Pradesh were taken up. Studies were also taken up on packing case wood, tribal housing, vegetative dyes etc. A New research programme on species recovery of RET was ventured.

The findings of Research in Tamil Nadu were last published as a compendium in 2003-04 and the implementable/adoptable recommendations were short listed in Tamil Nadu. The department has given special emphasis on technology transfer by way of completely integrating the Research and Extension Wings of Forest Department. More recently emphasis is being given to identification of field problems and providing solutions through Research under TAP programme.

The Annual Report 2004-05 has meticulously documented the information generated from the research experiments. I place my sincere appreciation to the Research Wing and am sure their efforts will continue and lead to more publications highlighting the achievements.

Principal Chief Conservator of Forests,
Tamil Nadu Forest Department

Thiru. **Gautam Dey,** I.F.S.,
Additional Principal Chief Conservator of Forests,
(Research, Extension & Working Plan),
Chennai - 600 015.

PREFACE

Forests and trees play very important role in the daily lives of people. The direct and indirect dependence of humans on forests, have started occupying the international agenda in recent decades.

The focus of forestry research had been on regeneration, production of industrial raw material, tree improvement and conservation studies during the last half of the previous century. However during the last decade, research was directed on important thrust areas like, Bio Diversity conservation, Bio productivity enhancement, Post harvest technology, Medicinal plants Agro forestry etc. Collaborative research project also were entered into with various institutions. Over 100 experiments were carried out every year in the seven Agro climatic zones.

This document brings together some of the salient achievements in forestry research. This is by no means an exhaustive compilation. It has recorded all the on going and current research activities that have taken place in the state, which will be of immense use to foresters, farmers, extension workers and research scholars.

I wish to specially thank the then Conservator of Forests(Research), Dr.N.Krishnakumar and his team of Deputy Conservator of Forests who had drawn and implemented all the research projects with atmost care and attention.

I wish to thank Thiru. H. Malleshappa, I.F.S., Conservator of Forests (Research) and his team of Deputy Conservator of Forests who have brought out this annual research report 2004-05 with suitable illustrations with the able guidance of Thiru. Ojha., Chief Conservator of Forests (Research).

I wish to acknowledge the efforts of all those who have contributed towards forestry research which have generated worthy results, finding a place in Annual Research Report in 2004-05.

Additional Principal Chief Conservator of Forests
(Research & Working Plan) Chennai

Thiru. **Rama Kant Ojha,** I.F.S.,
Chief Conservator of Forest (Research)
Tamil Nadu Forest Department
Chennai 600 015

PREFACE

Researchin Tamilnadu Forest Department has been need based. Fundamental Research, which has been generally the domain of the Research Laboratories of Universites, has not been taken up because they are expensive. Forestry management issues have been identified by the Research Technical Committee and the research areas identified by the committee of experienced foresters and Forestry Researchers. The thrust areas of the Forestry Research in Tamilnadu has been - Tree improvement, Bio-diversity conservation, Medicinal plant Conservation, Afforestation programmes, Silviculture, Environment Management, Forest Utilization, Organic tree farming, Agro forestry and Soil nutrient management etc.

During the year 2003-2004 some Reaearsh viz., Development of Trangenic Casuarina Eguisetifolia for salinity and drought tolerence, Micro propagation and Mass multiplication of Simaruba gluca, Ailanthus excelsa, Albizia richadiana, Melia dubea and Albizia falcatoria, production of specifie hybrid of Tamarind, Microbial consortia for growth and development of trees, etc, were given out for collaborative research. Most of these studies are incomplete and continued in 2004-2005. A major constraint in completing these studies is the timely availability of funds which is being looked into now.

Good and useful work has been done in the field of seed germination trials. The seed germination of bamboo has given good insight on selection of species and prescription for soil amelioration in coastal areas. Experiments on performance of bamboo for coastal areas are being taken up now and the result are likely to give useful prescription for protecton of coastal areas including those affected by Tsunami disaster.

The soil science laboratory at SFRI and the Forest Utilisation Unit has done exemplary work in the field of soil analysis, field studies and utilization of secondary timber. It is proposed to extend the services of soil science lab to farmers too. The Forest Utilisation Division has studied the utility of secondary timber easily available in farmlands. The studies made in the field of treatment of timber for utility and texture will help to develop entrepreneurship and solve problem of employment in rural areas. But there is need to come out with cost effective solutions to the problems of farmlands so that it can be adapted. Efforts are being made in this direction.

During the year, a regular input from Research wing has been provided in field operations of afforestation viz., supply of quality seeds, information on stadardized planting and nursery techniques, supply of bio-nutrients and a lot more is to be done.

The Annual Research Report 2004-2005 is brought out. There is a define improvement over the earlier reports specially in analysis and result of experiments. I congratulate Thiru H. Malleshappa, IFS., Conservator of Foreater, Research and his immediate predecessor Dr. N. Krishnakumar, IFS., discussed the report among themselves and with officers who have worked in Research unit earlier.

I hope that the research finding of this year and earlier years which is now going to be published as a compendium of Research findings will help us extend the knowledge to the tree growers and entrepreneurs. This work is proposed to be taken up through the Forestry Extention Centres, which is already working, in close co-ordination with the research wing.

Chief Conservator of Forests (Research)
Chennai

Thiru. **H.Malleshappa,** I.F.S.,
Conservator of Forests (Research)
Chennai-06.

PREFACE

Recognizing the need for continuous development in Forest management practices, Forest research wing has carried out many valuable field experiments in priority thrust areas like, Tree improvement, Silviculture, Nursery Research, Organic farming, Afforestation, Post harvest technology, Medicinal plants research, soil nutrient management etc., Attention was bestowed on Bio diversity conservation and Bio productivity enhancement.

The year 2004-05 has been a fruitful year as some good, commendable research experiments were taken up to address various field issues and needs. The experiments, identified after many interactions, were tailored to meet different categories of users.

The annual research report 2004-05 carries salient features of the research works carried out. This document will be of immense relevance and useful to field foresters.

As an effort to increase the visibility, the research centres and modern nurseries were maintained and ongoing research activities were strengthened.

During the year 2004-05 the Research wing continuously received the guidance and encouragement from Thiru.J.C Kala,I.F.S., Principal Chief Conservator of Forests, Dr. Sukh Dev IFS., Principal Chief Conservator of Forests and Chief Wild Life Warden, Thiru C. k Sreedharan IFS., Additional Principal Chief Conservator of Forests (TAP). I wish to thank Thiru.S.Sundararaju I.F.S., the then Chief Conservator of Forests (Research) and Thiru Gautam Dey IFS., Additional Principal Chief Conservator of Forests (Research & Working Plan) who have been an inspiration and instrumental for successful research activities. I wish to thank Thiru. Ohja, Chief Conservator of Forests (Research), for efforts taken to correct the document and to publish it. All the research experiments were meticulously carried out and periodically monitored during 2004-05 and the success is acclaimed to the then Conservator of Forests (research) Dr.N.Krishnakumar,I.F.S., and the team of field officers. There has been a remarkable achievement in all spheres of research activities. I am sure this report will create opportunities for further improvement of Forestry research in the state.

I wish to thank Tmt. Jayanthi Murali,I.F.S., Forest Utilisation Officer, Chennai, Thiru. S.K.Shanmugasundaram,I.F.S., and Thiru. Nihar Ranjan, I.F.S., Deputy Conservator of Forests ,Forest Genetics Coimbatore, Thiru. G.Nagasamy,I.F.S., Deputy Conservator of Forests , Minor Forest Produce Research Division, Salem, Thiru V.C.Balraj, I.F.S., and Thiru. D. Purushothaman, Deputy Conservator

of Forests, Industrial Wood Research Division, Trichy, Thiru. T. Dhandapani, Deputy Conservator of Forests, State Forest Research Institute, Thiru. S.Selvaraj and Thiru. Jayabalachandran, Divisional Forest Officer, Modern Nursery Division, Dharmapuri for having presented their division Annual research report in time and for their valuable contribution in the field.

I wish to specially thank Tmt. C. Poongothai, Agriculture Officer, Soil Science and Selvi. Subbulakshmi, JRF, Forest Utilisation Office for their tireless effort put in the preparation of this Annual Research Report.

I wish to thank all Range officers, chemist , foresters, forest guards, Malis Plot watchers and also all the ministerial staff for their dedicated efforts.

Conservator of Forests (Research)
Research Circle.

FEED BACK AND EXCERPTS OF SOME COMMENTS ON ANNUAL RESEARCH REPORT 03-04

1. Vattakanal Conservation Trust
Project Office,
Post Box No.109,
Kodaikanal - 624 101.

Thanks for the very interesting annual report. There are really only two experiments we feel qualified to comment and that being the conversion of monostands to poly species in Kodaikanal, at the Gundar research centre and the progeny evaluation of *Alnus nepalensis* and *Acacia mearnsii* at Pambarpuram.

The establishment of plantations of Wattle, Eucalyptus and Pine in the grassland has assisted the spread of native Shola species. The shade provided by the exotics allows Shola seedlings to survive the harsh winter conditions characterized by dryness, cold nights and searing sunshine.

2. Thiru C. Venugopal, I.F.S.,
Principal Chief Conservator of Forests (Retired)
No.64, Gandhiji Nagar,
Cuddalore - 607 001.

I hereby acknowledge with thanks the receipt of "Annual Research Report" of Tamil Nadu Forest Department for the year 2003-2004. The excellent research works of the Tamil Nadu Forest Department have been highlighted properly. I hereby convey my congratulations to you and to your officers concerned for this commendable work.

3. C.P.R. Environmental Education Centre
The C.P. Ramaswami Aiyar Foundation,
1 Eldams Road,
Alwarpet, Chennai - 600 018

This is to acknowledge with thanks receipt of the Annual Research Report for the year 2003-2004. The achievements of the Tamil Nadu Forest Department have been very well delineated. My best wishes to you and your colleagues for greater growth in the years to come.

4. Thiru. R. Gunasekaran, I.F.S.,
Conservator of Forests,
Chennai Circle,
Chennai - 6.

I read with interest, the informative and colourful Annual Report of 2003-04 and it has promptly revealed the high spirited activities of Research wing. I find the research findings, particularly in silviculture research, Tree improvement and Afforestation research are very useful and of immediate field adoption value. The role of Casuarina and Cashew may be studied, with special reference to Tsunami problems in coastal region.

5. Sreekant Mehta
256, Advaita Ashram Road,
Fairlands, Salem - 636 016.

This is to acknowledge the receipt of your letter no. M1/2327/2005 dated 11.05.05 along with the Annual Research Report 2003-04.

I must indeed thank you for the same. It will take some time to go through the exhaustive and interesting report. Do keep in touch.

6. S.M.A. Aslam, I.F.S,(Retired)
No.17 Officers Colony I Street,
Raja Ram, Melta Nagar,
Chennai - 600 029.

The Research Report has done commendable work under the versatile active guidance of Mr. K.C. Kala, I.F.S. Principal Chief Conservator of forests and this highly matured and qualified scientific view.

Additionally it has been assured that comments and suggestions of the forest personnel of yester years have been taken into consideration while formulating the Report.

7. Tamil Nadu Agricultural University Forest College and Research Institute
Mettupalayam - 641 301

While acknowledging the receipt of the Annual Research Report of Tamil Nadu Forestry Research for 2004-05, I would like to congratulate you and all the departmental staff who have contributed in compilation of an excellent account of the various activities undertaken.

8. Dr. S. John Joseph, I.F.S (Retired)
Principal Chief Conservator of Forests (Retired)
No.17, North Main Road,
Anna Nagar, West Extension,
Chennai - 600 101.

It is giving in a graphic manner the work done in your 63 Research centers with all the relevant data and information in an attractive and readable form.

Your record of work during 2003-04 in the branches of Silvipasture, Tree improvement, Afforestation, Agro Forestry, Post Harvest Technology, Organic Tree Husbandry, Medicinal Plants, Soil nutrition and Bio Diversity Conservation are impressive. The transfer of technology to ensure that technology developed by these research agenda made available to Practioners, people and society needs to be pursued.

I congratulate you and your team on this good performance in research branch during 2003-04.

9. AdhiParasakthi Agricultural College
(Affiliated to Tamilnadu Agricultural University, Coimbatore - 641 003)
G.B. Nagar, Kalavai - 632 506,
Vellore District, Tamil Nadu.

I acknowledge with thanks, the receipt of the Annual Research Report 2003-2004. I would like to congratulate the officers and the staff associated with the Research wing of Tamil Nadu Forest Department for bringing out and excellent and exhaustive Annual Research Report 2003-2004. The research works will surely be the leading step in increasing and improving the green cover of our Nation. The contribution will be helpful in developing the forest cover in the coastal belts, which are all highly prone to tidal disturbances. I sincerely pray and wish that you and your team members succeed in all endeavors.

10. D. Dilip Kumar
Booksellers & Exporters
216/10, R.K. Mutt Road, I Floor,
Mylapore, Chennai - 600 004.

This has reference to our telephonic conversation regarding getting copies of 'Annual Research Report' for the US Library of Congress, 24 K.G.Marg, New Delhi. You will recall that we have visited you office - myself and Dr. Caroll, the Deputy Director of US Library of Congress in February 2005.

The US Library of Congress has asked for the following reports for their library. Kindly arrange to send us the copies & oblige.

I am herewith enclosing the letter addressed to you by the USLC, Delhi.

11. M.S. Swaminathan Research Foundation
3rd Cross Street, Institutional Area,
Taramani,
Chennai - 600 113.

On behalf of Prof. M.S. Swaminathan, Chairman, MSSRF, I would like to acknowledge receipt of the Annual Research Report for the year 2003-2004.

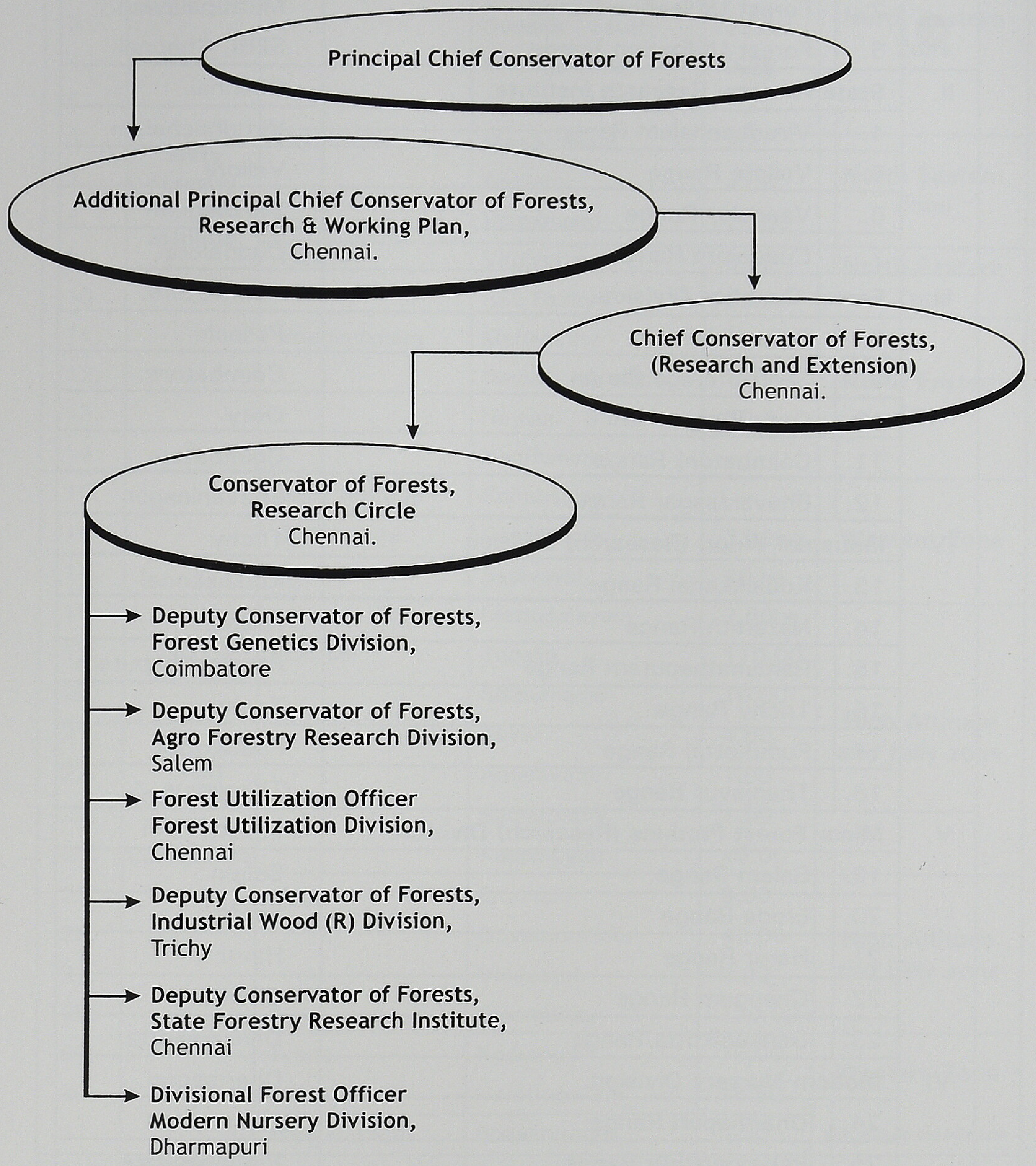
12. Dalmia Centre for Research & Development
B 133 & 134 Paripoorna Estates Sundakkamuthur Post,
Coimbatore - 641 010.

Thank you for your letter dated 28.6.05 along with the Annual Research Report of Tamil Nadu Forest Department Research wing for the year 2003-2004. I read with keen interest the Annual Research Report which has been excellently compiled and presented. The only suggestion I could offer is that the photographs in the report in future can be a little bigger so that details will be better visible.

Organization

ORGANISATION

Chief Conservator of Forests, (Research, Training & Extension) heads the Research wing of Tamil Nadu Forest Department and controls as per the following organisational structure.



Various research projects are undertaken in **63 Research Centres and Six Modern Nurseries** located in all the agro-climatic zones of the State.

THE DIVISION WISE RANGES WITH HEADQUARTERS ARE AS FOLLOWS

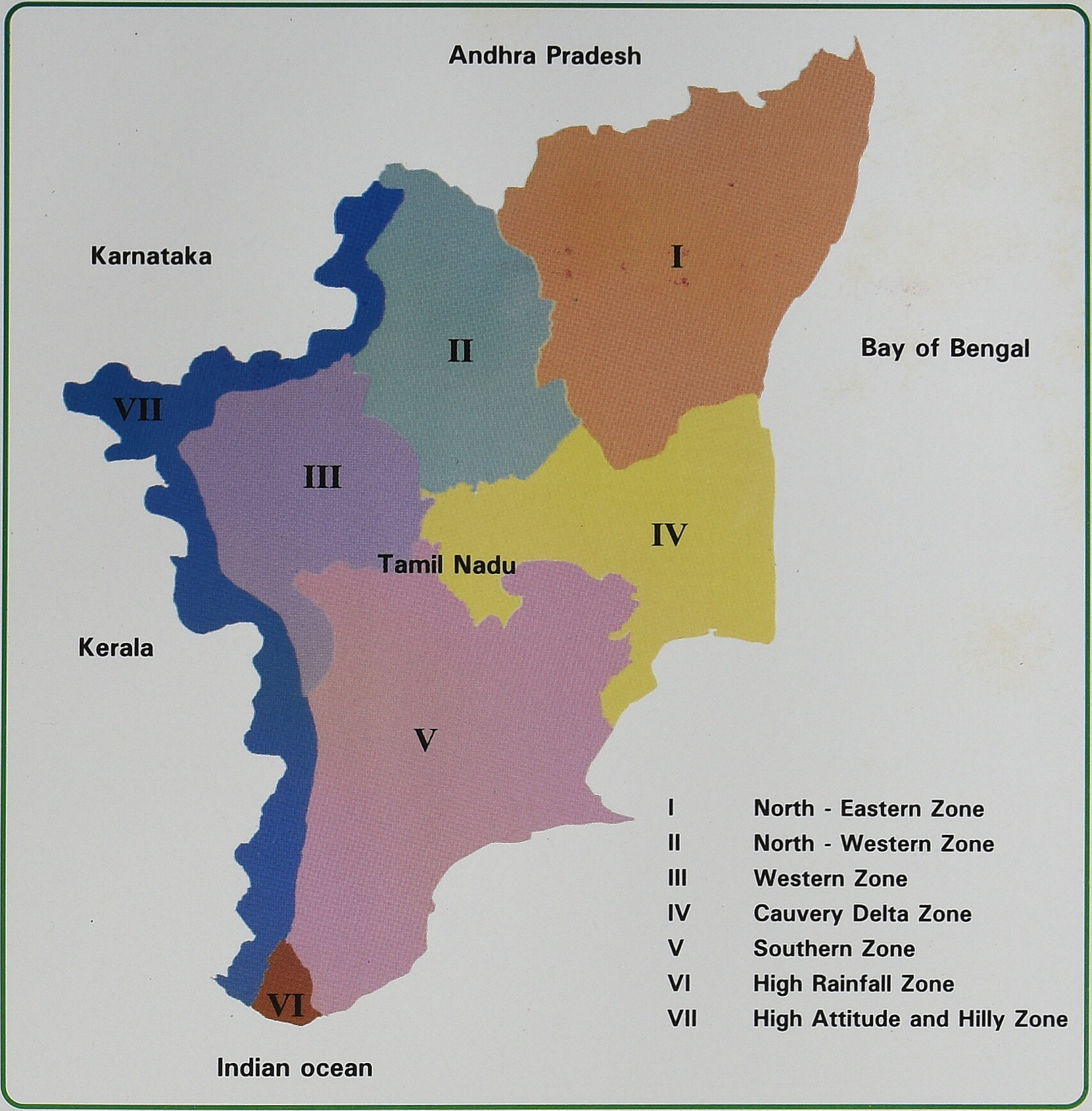
OFFICE			HEADQUARTERS
I.	**Forest Utilisation Officer.**		Chennai
	1.	Forest Utilisation Range	Chennai.
	2.	Forest Utilisation Range	Mettupalayam
	3.	Forest Utilization Range	SFRI, Chennai
II.	**State Forestry Research Institute**		Chennai.
	4.	Virudhachalam Range.	Virudhachalam
	5.	Vellore Range	Vellore
	6.	Vandalur Range	Vandalur
	7.	Cuddalore Range	Cuddalore
III.	**Forest Genetics Division.**		Coimbatore.
	8.	Pollachi Range.	Pollachi
	9.	Seed Storage Range	Coimbatore.
	10.	Ooty Range	Ooty
	11.	Coimbatore Range	Coimbatore
	12.	Bhavanisagar Range.	Bhavanisagar
IV	**Industrial Wood (Research) Division**		Trichy
	13.	Kodaikkanal Range	Kodaikkonal
	14.	Nazareth Range	Nazareth
	15.	Ramanathapuram Range	Ramanathapuram
	16.	Trichy Range	Trichy
	17.	Pudukottai Range	Pudukottai
	18.	Thanjavur Range	Thanjavur
V.	**Minor Forest Produce (Research) Division.**		Salem.
	19.	Salem Range	Salem
	20.	Erode Range	Erode
	21.	Harur Range	Harur
	22.	Chengam Range	Chengam
	23.	Denkanikotta Range	Denkanikotta
VI	**Modern Nursery Division.**		Dharmapuri.
	24.	Dharmapuri Range	Dharmapuri
	25.	Perungalathur Range	Perungalathur
	26.	Kallakurichi Range	Kallakurichi
	27.	Dindigul Range	Dindigul

Sl. No.	Division	Range	Centre	Area in ha	Agro-climate zone
1.	State Forestry Research Institute	Vandalur	Kolapakkam	700	North Eastern Zone
2.			Kattankulathur	20.00	
3.			Gudalur - South	25.00	
4.			Perungalathur	9.25	
5.			Gudalur - North	10	
6.		Cuddalore	Marakkanam	20	North Eastern Zone
7.			Agaram	41.8	
8.			Koonimedu	20.00	
9.		Vellore	Virchipuram	9.50	North Eastern Zone
10.			RSL Factory	03.95	
11.		Vridhachalam	Managathy	32.6	North Eastern Zone
12.			Neyveli - A block	140	
13.			Neyveli - B block	20.7	
14.			Narimanam		
15.	Forest Genetics Division, Coimbatore	Seed Storage	Coimbatore	--	Western Zone
16.		Coimbatore	Coimbatore	2.00ha	
17.			Sadivayal	30 ha	
18.		Pollachi	Mettupalayam	7.50ha	High Altitude and Hilly zone
19.			Topslip	110.00	
20.			Sethumadai	10.00	
21.			Aliyar	4.60	
22.			Amaravathi	1.00	
23.			Sarkarpathy	1.00	
24.			Kadamparai	45.00	
25.		Ooty	Erumadu	8.00	High Altitude and Hilly zone
26.			Governorshola	42.00	
27.			Valavayal	3.00	
28.			Glenmorgan	120.00	
29.		Erode	Kodumudi	15.00	Western Zone
30.			Varattupallam	16.50	
31.		Bhavanisagar	Bhavanisagar	5.00	High altitude and hilly zone
32.	Minor Forest Produce Research Division, Salem	Salem - G	Burnstandard	10.00	North Western Zone
33.			Kurumbapatti	10.00	
34.			Lokur	21ha	

Sl. No.	Division	Range	Centre	Area in ha	Agro-climate zone
35.	Minor Forest Produce Research Division, Salem	Salem - R	Sesanchavady	36ha	North Western Zone
36.		Harur	Ramanahalli	25.00	
37.		Chengam	Melchengam	40.00	North Eastern Zone
38.		Chengam	Jamunamuthur	42.00	High altitude and hilly zone
39.		Denkanikottai	Gopachandram	1.00	High Altitude and hilly zone
40.			Denkanikottai	40.00	
41.	Industrial Wood Research Division, Trichy	Kodaikonal	Berijam	48.00	High Altitude and hilly zone
42.			Guhdar	34.00	
43.			Perumalmalai	50.00	
44.		Madurai	Melakadu	34.60	Southern zone
45.			Nambakoil	8.45	
46.			Thangachimadam	18.85	
47.			Vemburali	25.60	
48.			Endalaparai	3.00	
49.		Nazareth	Keeriparai	7.50	High Altitude and hilly zone
50.			Pallakulam	64.00	
51.			Pattakarai	28.00	
52.			Poochikadu	5.00	
53.		Trichy	Mukkombu	5,7ha	Cauvery delta zone
54.			Lingamalai	13ha	
55.			Thuraiyur	49.49	
56.		Thanjavur	Sholapuram	40.00	
57.			Gopalasamuthram	19.00	
58.		Pudukottai	Arimalam	95.80	Southern zone
59.	Modern Nursery Division, Dharmapuri	Dharmapuri	Thoppur	5.60	North Western zone
60.			Harur	9.25	
61.		Dindigul	Kalamavoor	5.40	Southern zone
62.			Valkaradu	9.25	
63.		Perungalathur	Perungalathur	9.25	North Eastern zone
64.		kallakurchi	Alwarmalai	10.00	
65		Ulundurpet	Edaikkal	84.70	North Eastern Zone
66.			Neyveli - H block	55.5	
67.			Kadavanur	8.00	
68.			Asanur	58.00	
69.			Parigam	0.45	

Agro climatic Map

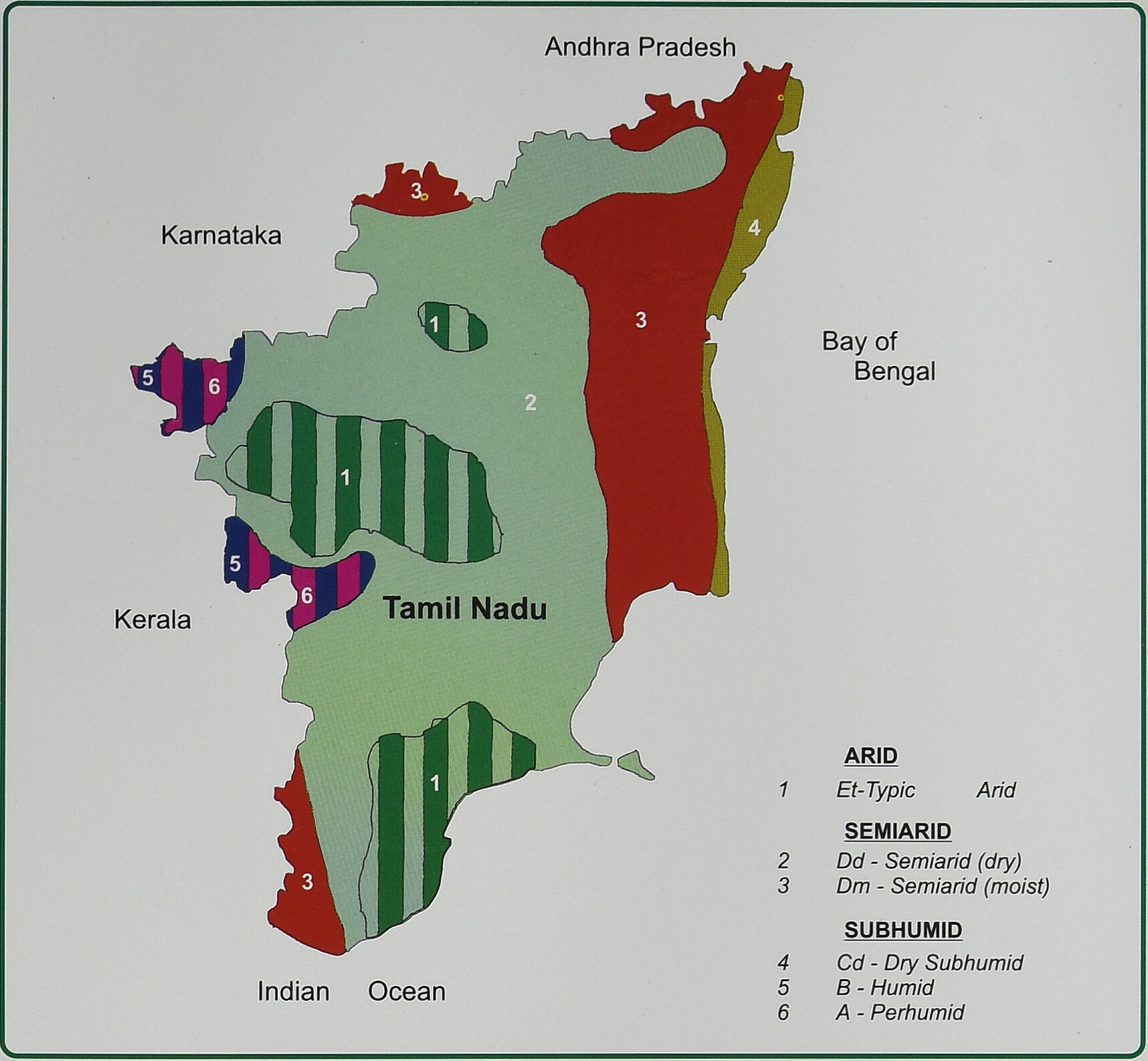
AGRO-CLIMATIC ZONES TAMIL NADU



Sl. No.	Agro-climatic zones	No. of Research Centres
1.	North-Eastern Zone	22
2.	North-Western Zone	7
3.	Western Zone	6
4.	Cauvery Delta Zone	5
5.	Southern Zone	8
6.	High Rainfall Zone	4
7.	High Altitude and Hilly zone	17
	Total	69

Bio Climatic Map

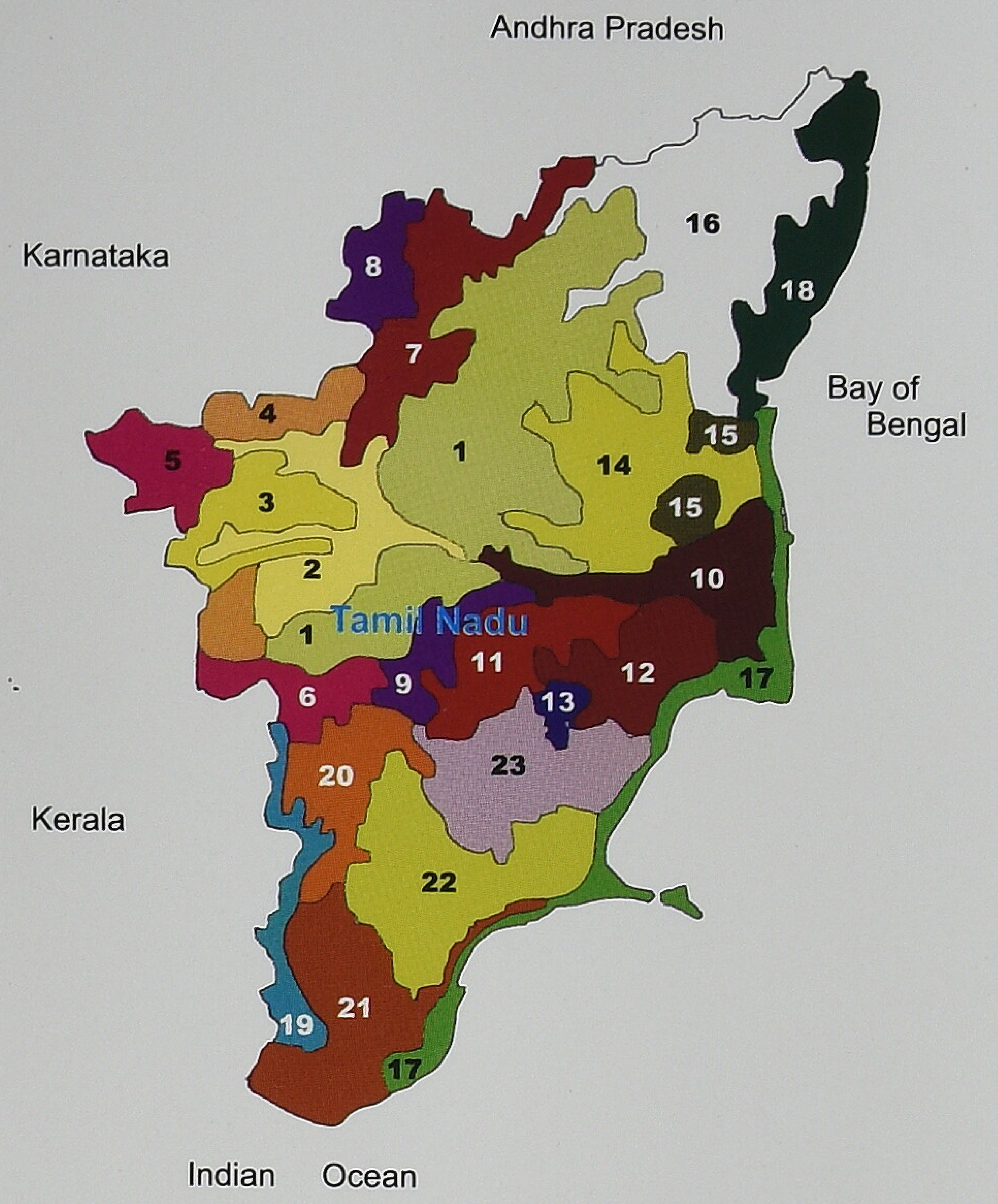
Bio-climatic Zones Tamil Nadu



Sl. No.	Bio-climatic zones	No. of Research Centres
1.	Et - Typic Arid	11
2.	Dd - Semiarid (dry)	44
3.	Dm - Semiarid (moist)	3
4.	Cd - Dry subhumid	6
5.	B - humid	1
6.	A - Perhumid	3
	Total	69

Soil Map of Tamil Nadu

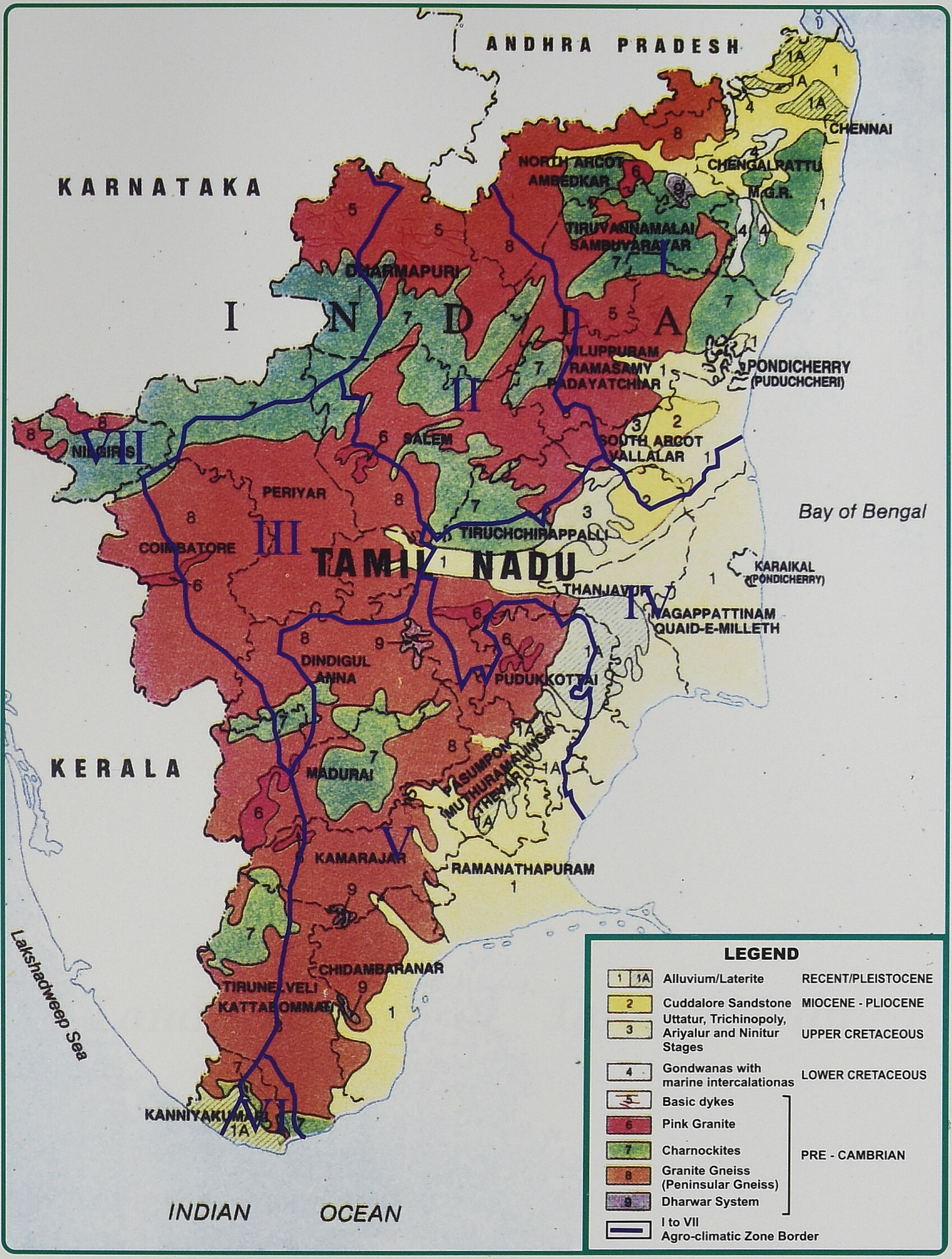
Soil Map of Tamil Nadu



Sl. No.	Soil Description	No. of Research Centres
1.	Upland soils - Gravelly loam to gravelly clay	4
2.	Mixed Black and Red soils	3
3.	Mixed Red and Blsck soils	2
4.	Red Hill soils - loamy to gravelly clay	4
5.	Clay to gravelly clay	1
6.	Hill soils - loamy to gravelly clay	4
7.	Hill soils - loamy to clayey	6
8.	Red soils - loamy to clayey	1
9.	Gravelly loam to gravelly clay loam river bed soils	2
10.	Black river bed soils	5
11.	Poor base Red and lateritic soils	4
12.	Poor base Red and lateritic soils	2
13.	Poor base lateritic soils	-
14.	Black swell - shrink soils	7
15.	Poor base lateritic soils	4
16.	Gravelly loam, red and lareritic soils	5
17.	Sandy to standy loam waterlogged soils	-
18.	Typical beach sandy soils	1
19.	Hills soils - loamy to gravelly clay	-
20.	Mixed Red and Black soils	4
21.	Gravelly clay to gravelly loam red soils	5
22.	Black swell - shrink clay soils	2
23.	Poor base Red and lateritic soils	3
	Total	**69**

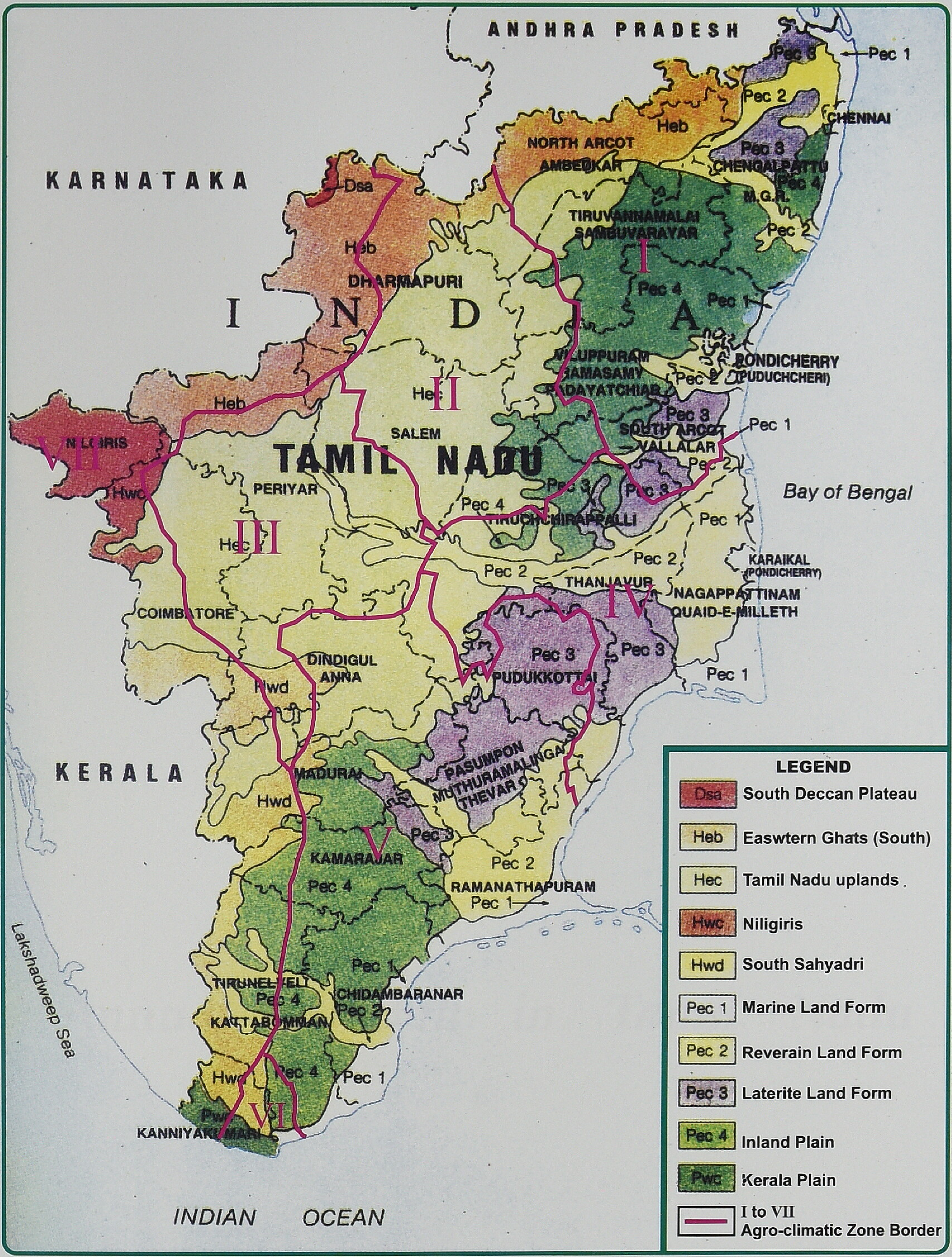
Geology Map of Tamil Nadu

Geology of Tamil Nadu



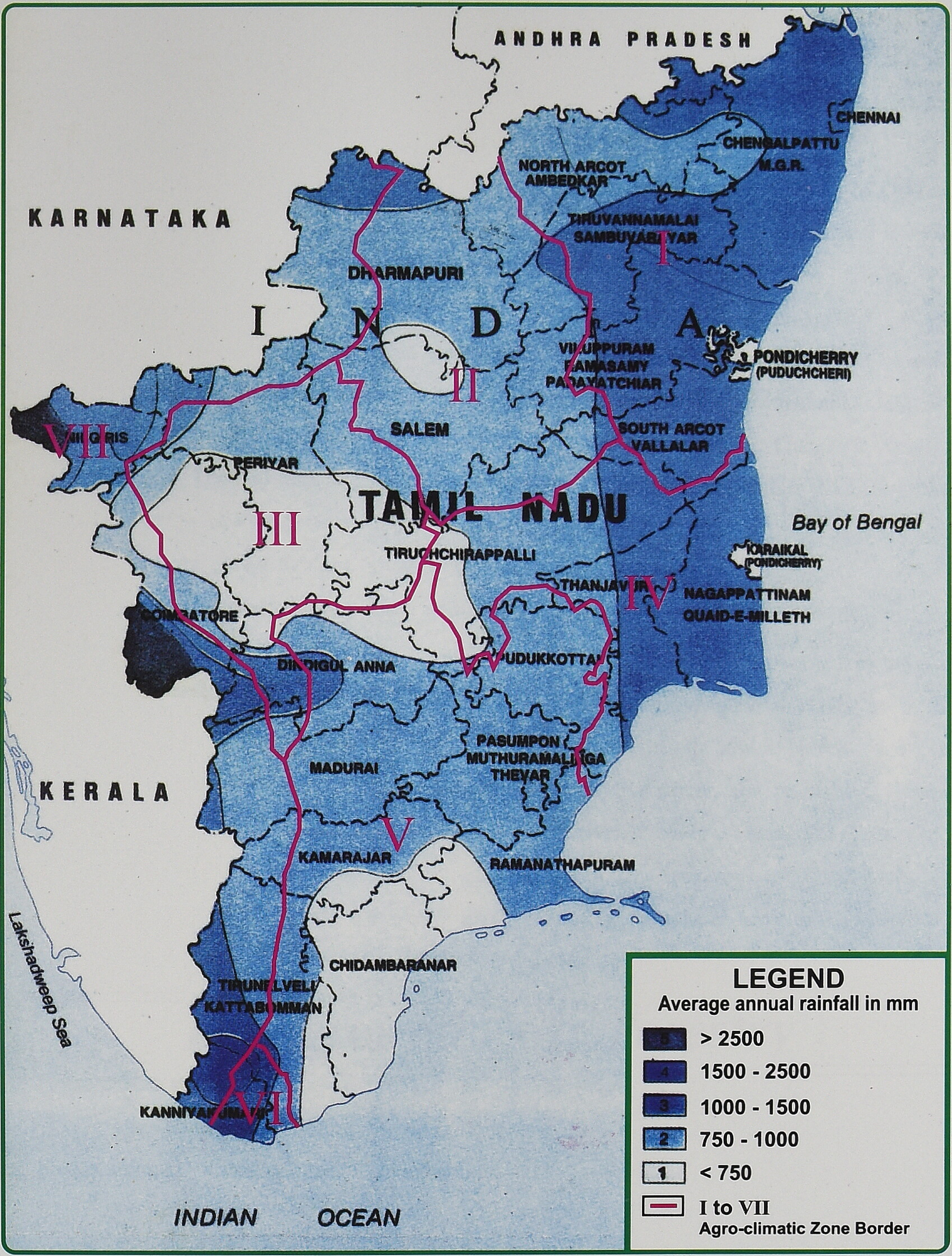
Land Forms of Tamil Nadu

Land Forms of Tamil Nadu



Annual Rainfall in Tamil Nadu

Annual Rainfall in Tamil Nadu



Background of Forestry

BACKGROUND OF RESEARCH ACTIVITIES IN TAMIL NADU

In Tamil Nadu, regular Forestry Research activities commenced with the appointment of State Silviculturist in the erstwhile Madras Presidency in 1918. The first Annual Research Report came out successfully during 1919.

Immediately after the Independence, emergence of indigenous forest based industries, demanded enormous raw materials. Therefore the main focus of forestry research was transformed to the production of industrial raw material such as pulpwood, timber and other forest products, and trials were taken up on silvicultural technical and economical suitability of important timber species for using them as industrial wood. Teak, Eucalyptus, Pines and Wattle were introduced in large scale for assured supply of raw material to forest based industries. Later the emphasis was shifted to evolve package of practices for cultural operation, density determination and regeneration.

In 1962 the concept of thorough site preparation as a paramount requisite for the afforestation work has emerged. In 1967 Forest Resources Survey Division has been created to provide the vital information on the growing stock, increment, annual felling, forest fire etc.

From 1970s, increase in productivity was given importance. Various trials on different vegetative propagation techniques like stem cutting, air layering, root suckers, budding and grafting were initiated.

During 1980s in the path of tree improvement programmes, identification of phenotypically superior individuals of Teak, Eucalyptus, Casuarina and Wattle was carried out. Establishment of Seed Production Areas, Seedling & Clonal Seed Orchards and Germplasm banks were carried out. During 1982, provenance trials in Eucalyptus tereticornis and Eucalyptus camaldulensis were laid out. About 60% increase in productivity was made possible by taking up planting of identified and selected suitable provenances in the field by Tamil Nadu Forest Plantation Corporation (TAFCORN) in the areas of Pudukottai, Karaikudi, Salem and Marakkanam. In addition, seeds obtained from Seed Orchards of Teak, Eucalyptus and Casuarina were used for establishment of superior plantations.

After the new forest policy the emphasis was on conservation of natural forest for obtaining intangible benefits without directly exploiting the forest. Experiments were laid out to study the population dynamics of flora and fauna in various forest types. Due emphasis was also given to augment the production of Non-wood Forest Produce (NWFP) such as fruits like Tamarind, Anona, Pungam, Gallnut and Soapnut.

In the late 1990s, the concept of organic farming with the application of eco-friendly bio-fertilizers to the nursery seedlings was given importance. Bio-fertilizers like Azospirillum, Rhizobium, Phosphobacteria and VAM (Vesicular Arbuscular Mycorrhizae) were inoculated to produce quality seedlings. By grafting technique, Tamarind was multiplied by establishing multiplication centres for large-scale production and were supplied to the farming community.

In 2001, new innovations have emerged in the fields of post harvest technology, bamboo research, medicinal plants, tree improvement and agro forestry. The present research thrust is on identification of fast growing hitherto unknown secondary timber, for agro forestry, timber for match species, Veneer production, Bamboo assemblage, identification of tree borne oil seeds, species recovery of

endangered species of various forest types and re-afforestation of degraded forest landscapes, with indigenous species, Afforestation programmes and research on microbial consortium for tree growth and transgenic Casuarina equisetifolia for salinity and drought tolerance. In short, the attention of research is on bio productivity enhancement and biodiversity conservation for poverty alleviation.

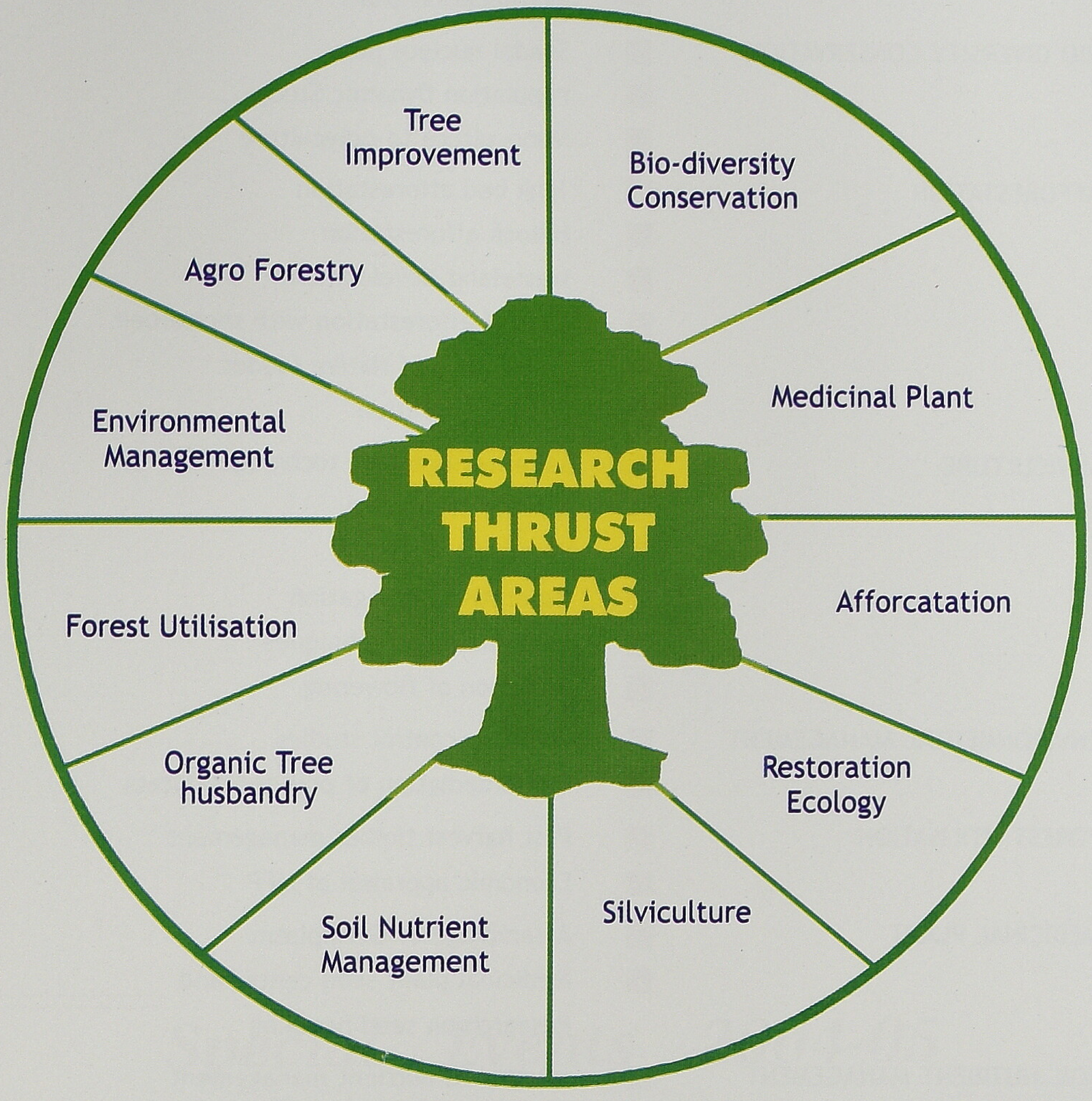
The Research wing also supported the mega Comprehensive Wasteland Development Programme, TAP Phase I and NAP by supply of quality seedlings, Vermicasting, VAM and Bio fertilizers like Azospirillum, Rhizobium and Phosphobacteria. The Research wing has also supported TAFCORN, Trichy TNPl, karur by supply of clonal propagules for Eucalyptus, besides supply of Vermicasting, VAM and Bio fertilizers.

TAP Phase II propoals for Rs.12.00 Crores were sent to avail financial assistance from JBIC and funds were sanctioned for four years from 2005 - 06 to 2009 - 10.

Thrust Areas of Forestry Research

FOREST RESEARCH - MISSION STATEMENT

Forestry research in Tamil Nadu will constantly monitor the status of forest, wildlife and eco system health and provide technical solutions for bio diversity conservation, bio productivity enhancement and sustainable development in the state. Research will provide support for Restoration of degraded areas, management of eco systems, promotion of agro forestry, increase and improvement of green cover for rural and urban prosperity and attention to all areas of forestry for the well-being of human society in the state.



RESEARCH THRUST AREAS
Tree Improvement
Bio-diversity Conservation
Medicinal Plant
Afforcatation
Restoration Ecology
Silviculture
Soil Nutrient Management
Organic Tree husbandry
Forest Utilisation
Environmental Management
Agro Forestry

Research thrsut areas	Main focus on
I. TREE IMPROVEMENT	Introduction Trial
	Assemblage of different species
	Progeny Trial
	Clonal Evaluation Trial
	Seed orchard
	Genetic combing
	Multilocation trials
II. BIO DIVERSITY CONSERVATION	Sandal nucleus plot
	Population Dynamic Study
	Monoculture to polyculture
III. AFFORESTATION	Tank bed afforestation
	Hillock afforestation
	Wasteland development
	Coastal afforestation with shelterbelt
	Assemblage of Native fodder
	Energy plantation
IV. SILVICULTURE	Seed management technique
	Nursery technology
	Espacement trial
	Vegetative propagation
	Ideal planting techniques
	Induction of flowering
V. ENVIRONMENTAL MANAGEMENT	Pollution control studies
	Bio-remediation of polluted habitats
VI. FOREST UTILISATION	Post harvest timber management
	Economic appraisal of MFP
VII. MEDICINAL PLANT	Assemblage of Germplasm
	Medicinal plant seed center and Research on seed handling
VIII. SOIL NUTRIENT MANAGEMENT	Integrated nutrient management
	Soil and moisture conservation
IX. ORGANIC TREE FARMING	Production of Vermicasting, VAM, biofertilisers and bio control agents
x. AGRO FORESTRY	Secondary timber for agroforestry
	Agroforestry models and intercropping
XI. RESTORATION ECOLOGY	Restoration of degraded habitats and forest types

Special Events 2004-05

Conference Hall Inauguration – 28.4.05 - Kolapakkam

TAP Phase II – Research Coloborative Meeting – 31.5.05

11th Research Technical Committee meeting – 9.11.04

TAP Training – 5.11.04, State Forest Research Institute, Kolapakkam

New and Ongoing Research Experiments 04-05

I. SILVICULTURE RESEARCH

a) Current year experiments (2004-05)

1. Study on plantation raising techniques for Canes.
2. Study on growth performance of selected matchwood species under drip irrigation
3. Study on identification of suitable species for pencil industry under drip irrigation
4. Identification of suitable tree species for Agro forestry bund planting
5. Study on performance of important Secondary timber species
6. Evolving suitable drip irrigation techniques for raising secondary timber species
7. Study on effect of root coiling on rate of espacement of *Bambax ceiba*
8. Experiment to evolve suitable espacement for *Khaya anthotheca*
9. Selection of suitable Bamboo species as an Agro forestry tree species
10 Raising of Sandal with natural host and its comparison with srtifical host
11. Optimization of bio-fertilizer does and pit sizes for maximum growth in *Terminalia chebula*

b) Ongoing Experimants (2003-04)

1. Raising *Simaruba glauca* to evolve cost effective package of practices
2. Raising energy palntation for 11 species with improved package of practices
3. Standardizing profitable package of cultivation and harvesting practices for promising introduced fast growing *Bamboo species*
4. Raising of Jatropha curcas plantation in a cost effective method with improved package of practices for maximum yield
5. Study on effect of pit sizes and bio-fertilizers application for *Ailanthus excelsa*
6. Raising *Albizia falcatoria* under protective irrigation

II. TREE IMPROVEMENT RESEARCH

a) Current year experiments (2004-05)

i) Seed Stands

1. Formation of seed stands for *Syzygium cumini*
2. Formation of seed stands for *Ailanthus excelsa*
3. Formation of *Casuarina junguniana* seed stand for seed production
4. Formation of seed stands for *Simaruba glauca*
5. Formation of *Simaruba glauca* seed stand under protected irrigation condition
6. Establishment of seed stand for *Melia dubia*
7. Establishment of provenance seed stand for *Gmelina arborea*
8. Establishment of seed stand for *Dalbergia latifolia*
9. Formation of seed stand for *Pterocarpus santalinus*
10 Establishment of seed stand for *Neem*
11. Establishment of seed stand for *Bassia latifolia*

12. Raising provenance Seed stand of Casuarina junghuhniana
13. Developing propagation technology for *Gmelina arborea* and *Pterocarpus marsupium*
14. Developing propagation technology and nursery technology for species for food security
15. Standardization of Nursery technology technology for furit yielding tree for frugivorous birds
16. Standardization propagation technology for Bambusa balcooa
17. Standardization of Clonal propagation technology for important species
18. Standardization of Clonal propagation technology for Teak

ii) Introduction Trials

1. Introduction trial of *Eucalyptus sp* (IFGTB)
2. Introduction trial of *Cinnamomum zeylanicum*
3. Introduction trial of *Decalepsis hamiltoni*
4. Introduction of *Casuarina junghuniana* (Timur) provenance
5. Introduction trial of *Melaluca alternifolia*
6. Assemblage of tree species suitable for packing case industry
7. Introduction trial of *Kaya senegalensis*
8. Introduction trial of *Dendrocalamus calstachyus*
9. Introduction trial of *Acacia elata*
10. Assemblage of Sandal Clones
11. Introduction trial of *Ceasalpinia sappan* - Mettupalayam
12. Introduction trial of *Swietenia mahogany*
13. Introduction trial of New Ecucalyptus species
14. Introduction trial of *Simaruba glauca*
15. Introduction trial of *Kaya antotheca*
16. Formation of Arboretum for important timber yielding tree species
17. Provenance trial of Andhra Pradesh Tamarind clones

ii) Hedge Stools

1. Formation of Hedge stoool for *Melia dubia*
2. Formation of Hedge stool for *Alnus nepalensis*
3. Formation of Hedge stool for *Casiarina junghuniana* (Male sterile)
4. Formation of Clonal Multiplication Area for *Tecctona grandis*
5. Clonal evaluation trial on Teak at Vaigai river bank
6. Development of propagation technique for *Mimosops elengi* and *Celastrus paniculatus*

b) Ongoing Experimants (2003-04)

1. Assemblage of Veneer yielding trees
2. Assemblage of dye yielding species
3. Formation of seeding seed orchad cum progeny trial for the Match wood species

4. Establishment of clonal seed orchard for *Simaruba glauca*
5. Progeny evaluation of *Alnus napalensis* and *Acacia mearnsii*
6. Genetic Combing
7. Assemblage of Bamboo Species

III. RESEARCH ON SOIL NUTRIENT MANAGEMENT

a) Current year experiments (2004-05)

1. Study on effect of Magnesium sulphate studge on growth and development important tree species
2. Study on effect of Magnesium Sulphate on natural forest cover
3. Effect of spent wash on natural forest cover
4. Study on effect of Integrated Nutrient Management on *Bassia latifolia, Jatropha curcas* and *Derris indica*
5. Study on evaluation of Organic mulching in *Simaruba galuca*

IV. AFFORESTATION RESEARCH

a) Current year experiments (2004-05)

1. Artificial Regeneration of Mangrove species
2. Improving Tank Bed Afforestation planting technique

b) Ongoing experiments (2003-04)

1. Reclamation and Reforestation of Sand dune Theri

V. AGRO FORESTRY RESEARCH

a) Ongoing experiments (2003-04)

1. Introduction of canes under *Kaya senegalensis* and Medicinal palnts

VI. BIODIVERSITY CONSERVATION RESEARCH

a) Current year experiments (2004-05)

1. Species recovery programme for critically endangered species - *Hildigardia populifolia*
2. Species recovery programme for critically endangered species - *Celastrus paniculatus*
3. Species recovery programme for critically endangered species - *Podocarpus wallichiana*
4. Species recovery programme for critically endangered species of Western Ghats
5. Species recovery programme for critically endangered species of Eastern Ghats

b) Ongoing experiments (2003-04)

1. Conservation of monostand into Poly stand with Shola in pine, Wattle & Blue gum palntation

VII. MEDICINAL PLANTS RESEARCH

a) Current year experiments (2004-05)

1. Assemblage of Medicinal Plants
2. Studies on Medicinal Palnts used by Tribals in Nilgiris and Topslip

VIII. RESEARCH ON ORGANIC TREE HUSBANDARY

a) Current year experiments (2004-05)

1. Comparing the quality of Vermicasting production with leaves of different species
2. Storing of vermicasting under different temperature and relative humidity condition and analzing for their quality
3. Finding out optimum requirement of water for vermicasting production
4. Effect of different host species on VAM production
5. Finding out the suitability of Fly ash as a medium for the production of vermicasting
6. Finding out optimum moisture content in vermicasting for better quality

XI. POST HARVESTING TECHNOLOGY

a) Current year experiments (2004-05)

1. Studies on utility of various thatching materials
2. Utility and durability of juvenile teak
3. Wood for packaging industries-horticultural crops and industrial materials
4. Vegetable dyes from forests
5. Testing the natural durability and study of mechanical properties, working qualities and effect of ammonia fumigation on fast growing secondary timber species available in Tamil Nadu
6. Evaluating the strength of the finger joined timber from the agro-forestry species & study the durability & logevity of the finger joined timber
7. Utilization studies of canes
8. Study on indigenious housing technology and tribal housing technology
9. Evaluation of characteristics of energy yielding crops to identify calorific value, oxygen content, moisture, sulphur and nitrogen & power generated per hour by the wood based gasifier
10. Finding out suitable alternative fast growing agro-forestry timber species to meet the requirement of the pencil making industries
11. Evaluation of nutrient content of different fruits avilable in Tamil Nadu
12. Studing vegetable tannins from forests
13. Study on suitability of fast growing agro-forestry species for making match splints
14. Utilization of different species of bamboo for agarbathi sticks
15. Survey of Bamboo trade and research in Tamil Nadu

b) Ongoing experiments (2003-04)

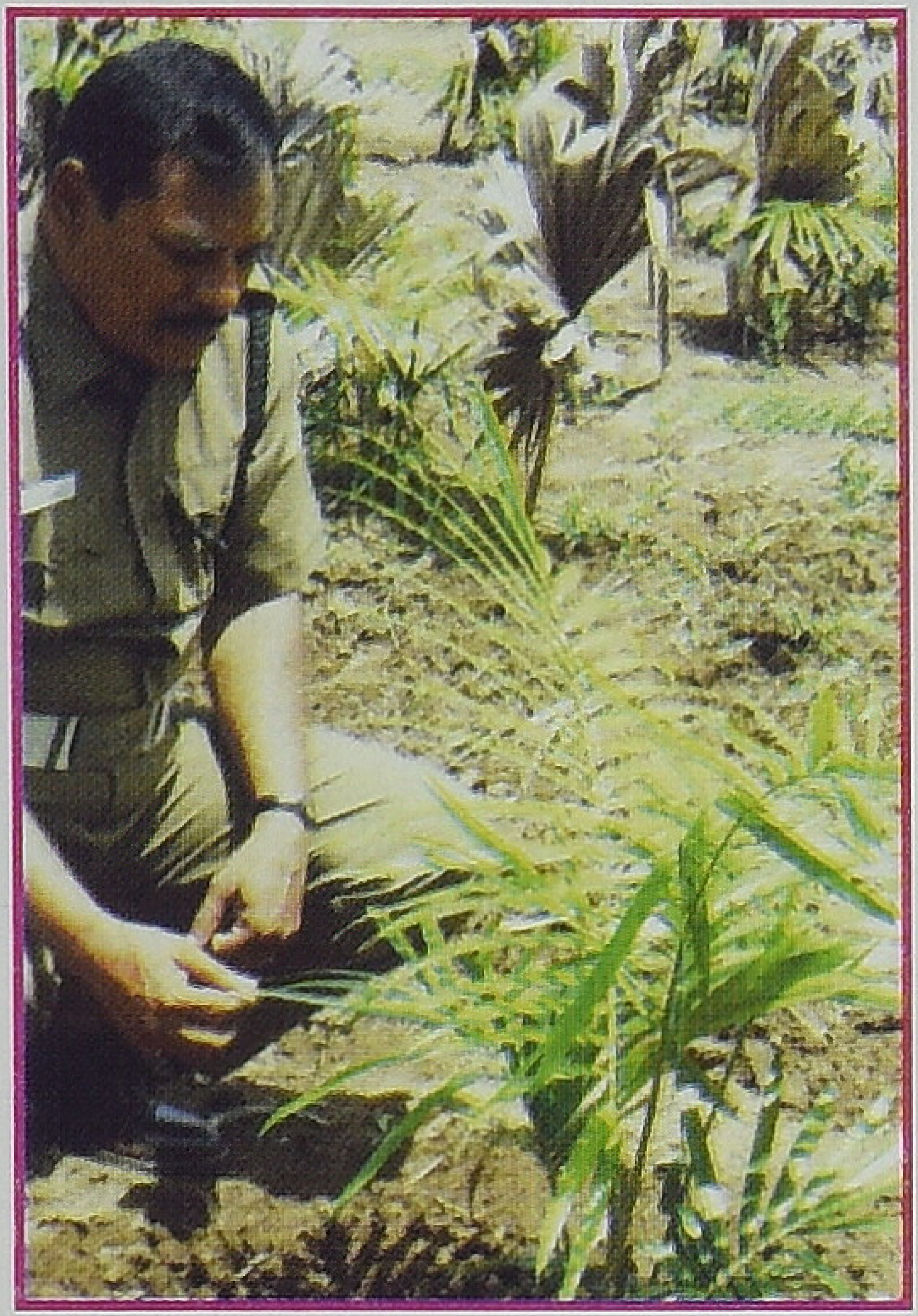
1. Formation of Bamboo Corridor
2. Fabrication of Furnitures
3. Utilization of Secondary timber species for Catamaran

I. SILVICULTURE RESEARCH

a) Current year Experiments(2004-05)

1. Study on plantation raising techniques for Canes.

The study was carried out at Mukkumbu Research Centre, Industrial Wood Research Division, Trichy during 2004-05 to find out suitable, successful planting technique for canes. Following treatments were imposed on the species namely *Calamus vattiayala, Calamus nagbetta, Calamus thwartsii.*



Treatments

T1	-	Planting seedlings
T2	-	Planting rhizomes

The above tree species were planted in 60cm^3 pit with an espacement of 2m x 2m and 3m x 3m. The performance is observed with and without application of bio-fertilizers as follows.

		Per pit
Vermicastings	-	400gms
VAM	-	60gms
Azospirillum	-	30gms
Phosphobacteria	-	30gms

Outcome

All the calamus species are performing well .The experiment is further under observation.

2. Study on growth performance of selected matchwood species under drip irrigation.

An experiment was conducted to find out the yield of different match wood species under various drip irrigation system, at Lingamalai Research Centre, Industrial Wood Research Division during 2004-05. The species namely *Ailanthus excelsa, Simaruba glauca, Wrightia tinctoria* were planted in 60cm^3 pits with bio-fertilizers as follows.

		Per pit
Vermicastings	-	600gms
VAM	-	40gms
Azospirillum	-	20gms
Phosphobacteria	-	20gms
Farm yard manure	-	1 kg.

Treatments

T1	-	Control
T2	-	1 ltr per hour for 2 hours, 2 ltrs per day.
T3	-	2 ltrs per hour for 2 hours, 4 ltrs per day.
T4	-	3 ltrs per hour for 2 hours, 6 ltrs per day.

Outcome

The height growth in drip irrigation system is 50% more than trees raised in control.

3. Study on identification of suitable species for pencil industry under drip irrigation.

The study was conducted at Arimalam and Melakkadu Research Centres, Industrial Wood Research Division, Trichy during 2004-05, to introduce the species, assess the growth performance, and to estimate its suitability by felling during 6th, 8th and 10th year for testing the utility. The species namely *Ailanthus excelsa, Simaruba glauca, Gmelina arborea, Bombax ceiba, Polyalthia longfolia* and *Ceiba pentandra* were raised in 60cm³ pits in espacement of 4m x 4m with the following bio-fertilizers.

View of Drip irrigated 7 months Ailanthus excelsa and clonal plants in Arimalam Research center

Treatments

Bio-fertilizers per pit (gms)		T1	T2	T3 (Control)
Vermicastings	-	400gms	400gms	–
Azospirillum	-	30gms	30gms	–
Phosphobacteria	-	30gms	30gms	–
Poultry manure	-	400gms	Nil	–

Outcome

The results can be concluded in the subsequent years since it is too early.

4. Identification of suitable tree species for Agro forestry bund planting

The study was undertaken at Melakkadu Research Centre of Industrial Wood Research Division, richy to find out suitable tree species for bund planting by evaluating the yield. The species such as *Kaya senegalensis, Bombax ceiba and Casurina junghuniana* were planted on the bunds in a pit size of 45cm³ with following treatments.

View of 6 months growth of Bombax ceiba in 2004 Agro Forestry bund planting in Melakkadu (R) centre

Treatments

	T1(Control	T2(gm)	T3(gm)
Vermicasting	–	500	500
VAM	–	50	50
Azospirillum	–	15	15
Phosphobacteria	–	15	15
Farm Yard Manure	–	–	2Kg

Outcome

Growth performance of *Kaya senegalensis* and *Casuarina junghuniana* are better than *Bombax ceiba.*

5. Study on performance of important Secondary Timber Species.

The experiment was conducted at Thangachimadam (Coastal Zone), Industrial Wood Research Division, Trichy to identify suitable timber species for the agro climatic zone and to stabilize coastal sand and to improve the soil fertility. The species such as *Acacia auriculiformis, Thespesia populnea, Dalbergia sisoo, Albizia lebbeck, Acacia hybrid, Grewia tealiaefolia* and *Kaya senegalensis* were tried in an espacement of 3m x 3m and 60cm^3 pits to evaluate the following treatments.

Treatment	Vermicasting (gms)	VAM (gms)	Azospirillum (gms)	Phospho bacteria (gms)	Farm yard manure (Kg)	Poultry manure (Kg)
T1				Control		
T2	400	50	25	25	–	–
T3	500	50	25	25	–	–
T4	500	50	25	25	1	–
T5	600	50	25	25	–	–
T6	400	50	25	25	1	1

Outcome

Performance of species will be assessed from the next year onwards .

6. Evolving suitable drip irrigation techniques for raising secondary timber species

At State Forest Research Institute, Kolappakkam the following species were raised to find out the performance of each species under different drip irrigation system during 2004-05.

Species:

Match wood species	Boat building sp	Veneer yielding sp	Furniture sp
Ailanthus malabaricum	Albizia falcatoria	Calophillum inophyllum	Acacia suma
Ailanthus excelsa	Thespesia populnea	Kaya senegalensis	Acacia hybrid
Gmelina arborea	Sterculia urens	Eucalyptus grandis	Artocarpus Integrifolia

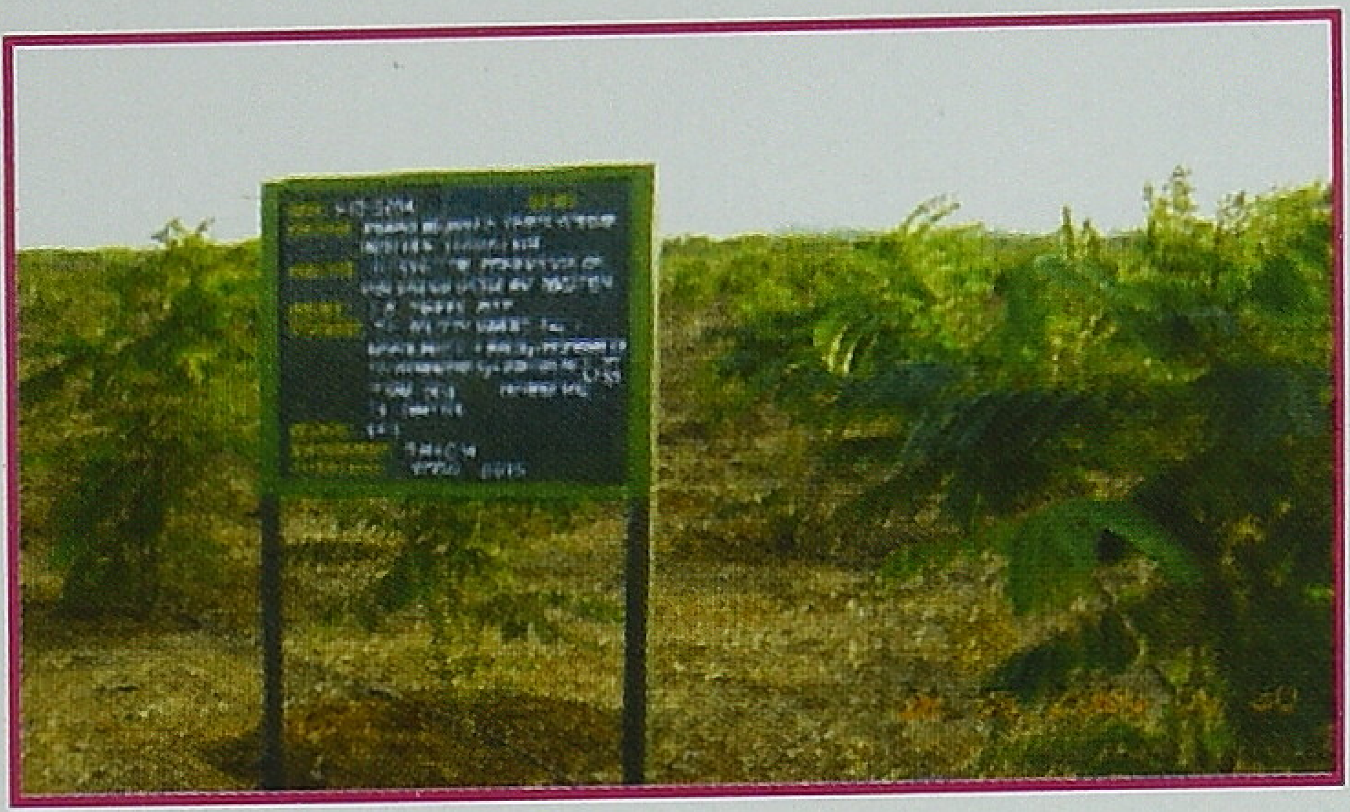
Treatment:

Drip irrigation - 20lit/week

F1 - Poultry manure 1 Kg + Azos25g + PB 25 g

F2 - VC 1Kg + Azos25g + PB 25 g + VAM 50g

F3 - Control



Secondary Timber under Drip irrigation, Kolapakkam

Outcome

The experiment is under observation.

7. Study effect of root coiling on rate of establishment of *Bombax ceiba*

The study was conducted at State Forest Research Institute, Kolappakkam during 2004-05 Generally in all forest nurseries, some of the excess seedlings are kept and maintained for more than one year without timely utilization. These seedlings are tall and most of them are suffering from root coiling due to prolonged retention in the polythene bags. This study was undertaken to find out effective management strategies to utilize such seedlings for afforestation. The rate of establishment and growth of these seedlings with and without root pruning/root dressing was observed in *Bombax ceiba*.

Treatment:

T1-Control without root pruning

T2-With root pruning

T3-Seedlings raised this year

Outcome

Experiment is under observations

8. Experiment to evolve suitable espacement for *Kaya antotheca*

Kaya antotheca is an exotic species otherwise called as Red African Mahogany extensively used for furniture making. To asses the suitability of this species for our climatic condition the seeds of *Kaya antotheca* was imported from Tanzania and raised in an espacement of 3mx3m, 4mx4m & 5mx5m in 60cm^3 pits for furniture making at Seshanchavady Centre, Minor Forest Produce Research Division, Salem.

Bio-fertilizer doses:

Poultry manure-400g

Vermicasting - 400g

VAM - 60g

Azospirillum - 30g

Phosphobacteria - 30g

Outcome

Experiment is under observation.

Introduction and espacement trial of Khaya anthotheca at Sheshanchavady

9. Selection of suitable Bamboo species as an Agro-forestry tree species

Bamboos act as a wind breaks, weather buffer and enhance food security. It is extensively used for manufacture of large number of value added goods, handicrafts and also used for conserving soil. This study was undertaken to evaluate the productive potential of the best performing bamboos for different agro-climatic zones. Bamboos were planted in an area of 2.20 ha in an espacement of 5mx5m in $60m^3$ pits at Melchengam, Minor Forest Produce Research Division, Salem during 2004-05.

Treatments:

F1-control

F2-vermicompost(1kg)

F3-poultry manure(1kg)

F4-inorganic fertilizer-100gms(DAP) in two split doses

W1-control(no watering)

W2-with watering

Outcome

Experiment is under observation

10. Raising of Sandal with natural host and its comparison with artificial host

Sandal is a parasitic plant which needs a host plant like neem, pungan, vagai for its growth. This study was conducted at Chitteri, Minor Forest Produce Research Division, Salem during 2004-05 to compare the growth of Sandal with artificial host to identify suitable natural host for their mass multiplication. Sandal were planted in an espacement of 4mx4m in $60cm^3$ pits.

Bio-fertilizer doses:

Vermicasting - 500g

VAM - 75g

Azospirillum - 20g

Phosphobacteria - 20g

Outcome

Growth rate is under observation.

11. Optimization of bio-fertilizer doses and pit sizes for maximum growth in *Terminalia chebula*

This expe\riment was conducted at Seshanchavady, Minor Forest Produce Research Division, Salem during 2004-05 to find out the optimum combination of Vermicasting and Bio-fertilizers and to find out the optimum doses of Bio-fertilizer with different pit sizes of 45cm^3, 60cm^3 and 80cm^3 in an espacement of 3mx3m for the maximum growth of *Terminalia chebula*.

Treatments*(Gms)*

Pit size	Treatments	Poultry manure	Vermi casting	VAM	Azosp irillum	Phospho bacteria	Tricho derma	Pseudom omnas
45 cm^3	T1	500	500	–	–	–	–	–
	T2	–	500	40	20	20	10	10
	T3	–	–	40	20	20	–	–
	T4	500	500	–	–	–	10	10
	T5	500	–	40	20	20	–	–
	T6(Control)	–	–	–	–	–	–	–

Pit size	Treatments	Poultry manure	Vermi casting	VAM	Azosp irillum	Phospho bacteria	Tricho derma	Pseudom omnas
60 cm^3	T1	500	500	–	–	–	–	–
	T2	–	500	40	20	20	10	10
	T3	–	–	40	20	20	–	–
	T4	500	500	–	–	–	10	10
	T5	500	–	40	20	20	–	–
	T6(Control)	–	–	–	–	–	–	–

Pit size	Treatments	Poultry manure	Vermi casting	VAM	Azosp irillum	Phospho bacteria	Tricho derma	Pseudom omnas
80 cm^3	T1	500	500	–	–	–	–	–
	T2	–	500	40	20	20	10	10
	T3	–	–	40	20	20	–	–
	T4	500	500	–	–	–	10	10
	T5	500	–	40	20	20	–	–
	T6(Control)	–	–	–	–	–	–	–

Outcome

Growth rate is under observation

b) ONGOING SILVICULTURE RESEARCH

1. Raising *Simaruba glauca* to evolve cost effective package of practices

Simaruba glauca is popularly known as "Paradise Tree". This is an evergreen tree originated from E L salvador, Brazil. It is well adopted to varied weather conditions. Being a drought tolerant tree, it can be an ideal tree species for afforesting the wasteland. Tamil Nadu state, which comes in deficit rainfall zone with erratic rainfall has vast tracts of wasteland Cultivation of this species has immense scope for utilization of wasteland there by primary sector upliftment. A study was conducted at the research centres viz, Mettupalayam, SFRI, Neyveli, Mangathy, Melakkadu, Seshanchavady and Maragatta to evolve a suitable, economical package for cultivation of *Simaruba glauca*

Two planting methods (Pit planting and Saucer planting), 2 espacements (5m x 5m, 6m x 6m), two pit sizes (80cm^3 and 1m^3) and with a saucer diameter of 3m diameter, and centre to centre distance of (7m x 7m and 8.5m x 8.5m) along with the control were tried.

Treatment	Pit Planting		Saucer planting		Pit sizes		Bio fertilizers	
	5m x 5m	6m x 6m	7m x 7m	8.5m x 8.5m	80cm^3	1m^3	Vermicasting 1kg, VAM 100g, Azospirillum 25g Phosphobacteria25g	Vermicasting 2kg, VAM 200g, Azospirillum 25g Phosphobacteria 50g
T1(C)	✓	—	—	—	✓	—	—	—
T2	✓	—	—	—	—	—	✓	—
T3	✓	—	—	—	—	✓	—	✓
T4	—	✓	—	—	✓	—	✓	—
T5	—	✓	—	—	—	✓	—	✓
T6	—	—	✓	—	✓	—	✓	—
T7	—	—	✓	—	—	✓	—	✓
T8	—	—	—	✓	✓	—	✓	—
T9	—	—	—	✓	—	✓	—	✓

Evolving Package of practices for Simaruba glauca under Rainfed condition

Neyveli 'A' Block

Outcome

The saucer planted seedlings are performing better than the conventionally planted seedlings especially in 45cm^3 pit. That is the treatment 8 (T_8) is performing better at Neyveli but in Kolapakkam the treatments T_2 and T_5 are best and on par.

2. Raising energy plantation for 11 species with improved package of practices

Tamil Nadu is energy deficit state as we cannot depend on hydel projects for power supply especially during summer. An eco friendly way to harvest sun energy is to convert it to electrical energy through biomass by raising captive plantations of fast growing species. The objective of the experiment was to determine improved package of practice for energy wood species. The species tried were as follows in different centres namely Neyveli, State Forest Research Institute, Thangachimadam and Ramanahalli.

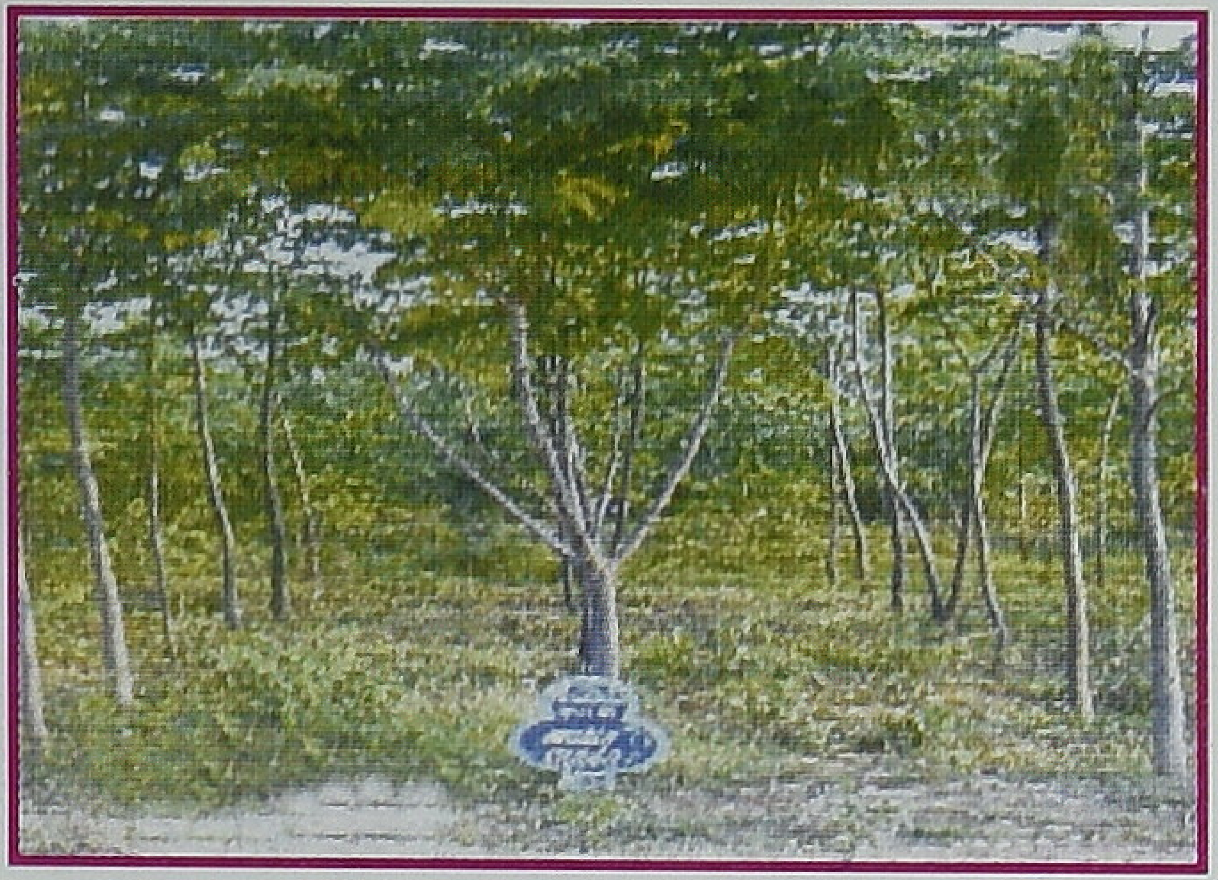
1. Cassia siamea
2. Albizia richardiana
3. Acacia hybrid
4. C. junghuniana (seed)
5. Casuarina junghuniana
6. Delonix elata
7. Bambusa mukalba
8. Kaya senegalensis
9. Eucalyptus clones
10. Acacia auriculiformis
11. Mixed plot of all the above species in equal numbers

The above mentioned species were planted in 30cm^3 and 45cm^3 pit with an espacement of 1.5 x 1.5m.

Raising Energy plantation - Irrigated

Kolapakkam

Raising Energy plantation - Rainfed



Kolapakkam

Cultivation of Energy wood tree species Al. Richardiana at Ramanahalli

Cultivation of Energy wood tree species Al. Richardiana at Seshanchavady (R) Centre

Outcome

During the 2nd year it was observed that Acacia auriculiformis has given maximum yield than all other species. ITC 3 performs next to A.auriculiformis in both the pit sizes.

3. Standardizing profitable package of cultivation and harvesting practices for promising introduced fast growing Bamboo species

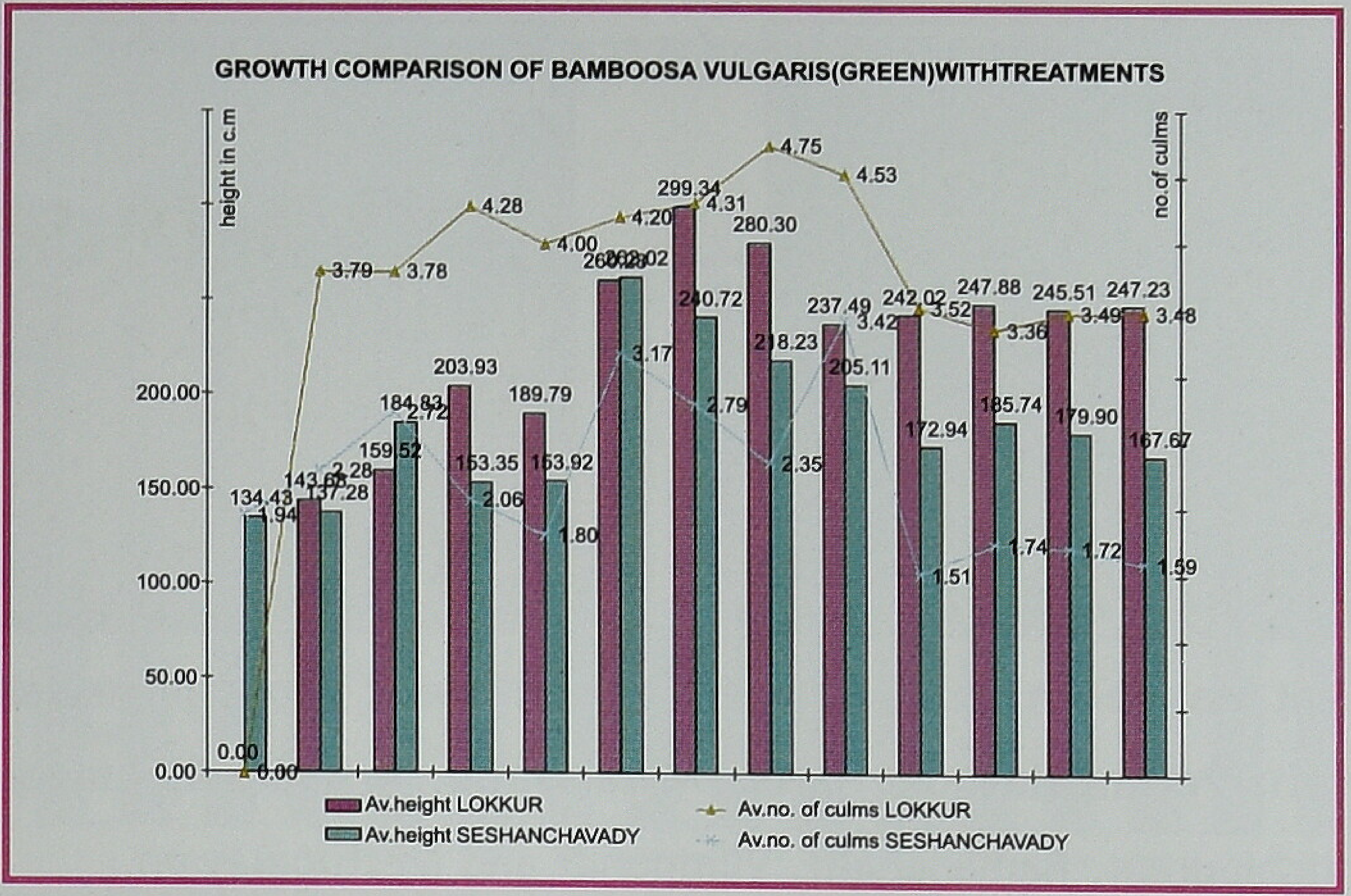
Bamboos are unique tree species with high carbon sequestration potential, fast growth rate and capabilities of high biomass production per unit area. The experiment was initiated during 2003 in Industrial Wood Research Division, Trichy, Minor Forest Produce Research Division, Salem at Varattupallam, State Forest Research Institute, Chennai and Modern Nursery Division, Dharmapuri. The objective of the experiment was to evaluate the productive potential of the best performing Bamboo species and to find out growth rate and standardizing cost effective package of practices. The trial was laid out with two different planting methods (pit planting and saucer planting) and two different spacing (5m x 4m and 5m x 5m), 2 different pit sizes (60cm^3 and 1m^3) and two different harvesting methods (First harvesting starts from 40th month onwards. In harvesting method 1, during each harvesting, the number of culms formed in the current year along with one culm formed in the previous year has to be retained and the rest have to be harvested. Similarly in method 2, the number of culms to be retained in all the current year culms along with five of the previous. The treatments are as follows.

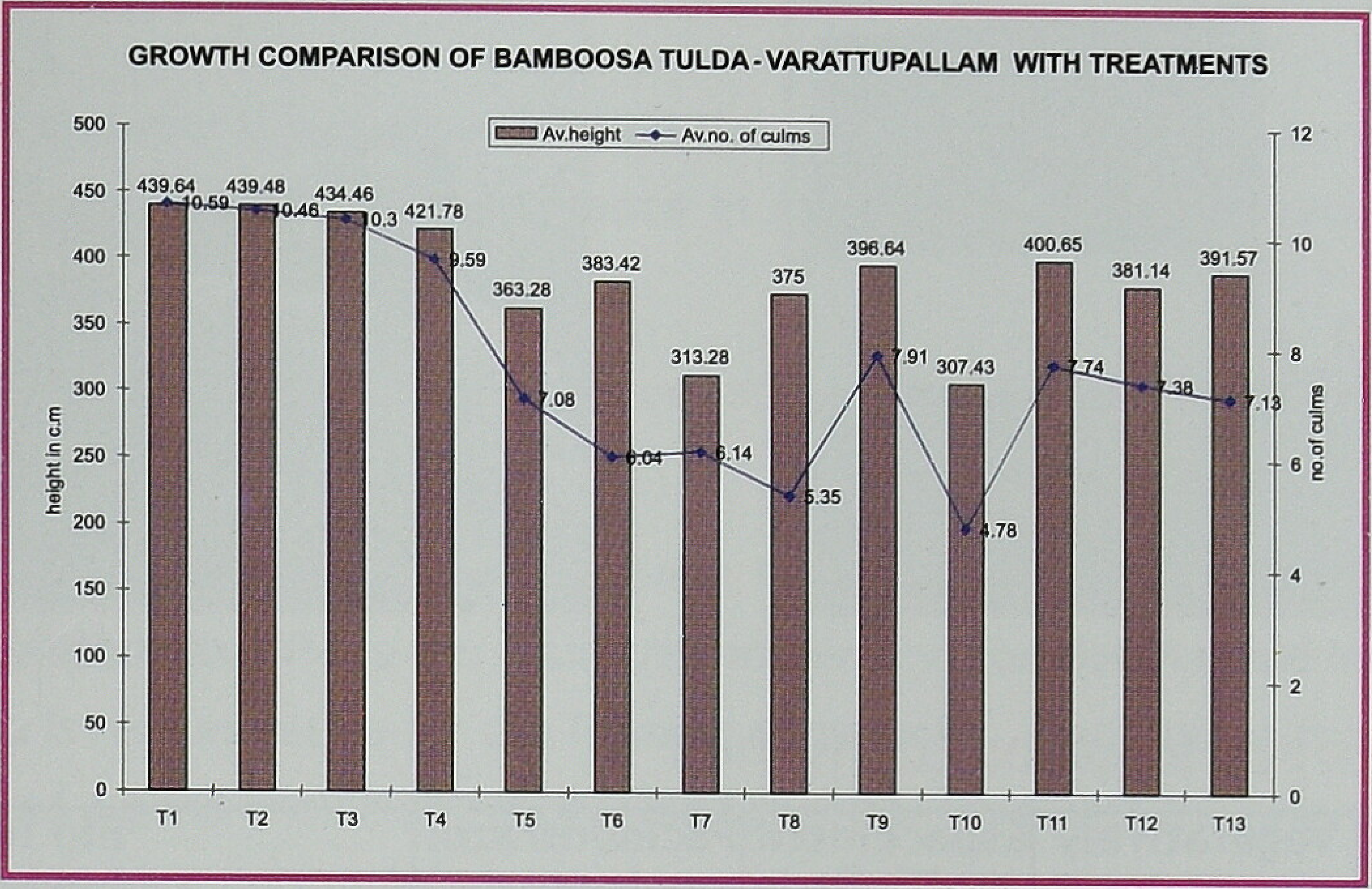
Treatment

Treatment	Rainfed	Irrigated	Pit Planting		Saucer planting		Harvesting method		Bio fertilizers Vermicasting 2kg, VAM 200g, Azospirillum 20g Phosphobacteria20g
			5m x 4m	5m x 5m	6m x 6m	7m x 7m	Method 1	Method 2	
T1(C)	✓	–	✓	–	–	–	✓	–	–
T2	✓	–	✓	–	–	–	✓	–	✓
T3	✓	–	✓	–	–	–	–	✓	✓
T4	✓	–	–	✓	–	–	✓	–	✓
T5	✓	–	–	✓	–	–	–	✓	✓
T6	✓	–	–	–	✓	–	✓	–	✓
T7	✓	–	–	–	✓	–	–	✓	✓
T8	✓	–	–	–	–	✓	✓	–	✓
T9	✓	–	–	–	–	✓	–	✓	✓
T10	–	✓	✓	–	–	–	✓	–	✓
T11	–	✓	✓	–	–	–	–	✓	✓
T12	–	✓	–	✓	–	–	✓	–	✓
T13	–	✓	–	✓	–	–	–	✓	✓

TREATMENT DETAILS FOR BAMBOOS CULTIVATION

		Kolapakkam		Neyveli A Block	
Sl. No.	Treatment	No. of Culms	Mean ht (m)	No. of Culms	Mean ht (m)
1.	T1(C)	5	2.6	4	1.6
2.	T2	5	3.1	6	2.8
3.	T3	5	3.0	6	2.3
4.	T4	4	2.9	6	1.9
5.	T5	4	2.8	6	2.8
6.	T6	6	3.0	6	2.2
7.	T7	6	3.2	6	3.8
8.	T8	7	3.1	6	3.8
9.	T9	6	3.6	6	3.8
10.	T10	8	3.4	10	2.7
11.	T11	6	3.0	10	3.1
12.	T12	7	3.2	10	4.1
13.	T13	8	3.6	10	3.8





Outcome

During the second year it was observed that the treatment T13 performs better than all other treatments i.e. the irrigated bamboos grow well than the rainfed bamboos in Kolapakkam. The treatment T12 performs better than all other treatments i.e. the irrigated bamboos grow well than the rainfed bamboos in Neyveli A Block.

4. Raising of Jatropha curcas plantation in a cost effective method with improved package of practices for maximum yield

Jatropha curcas is a multipurpose tree and drought resistant. The oil extracted from this species can be used to produce bio fuel. Cultivation of Jatropha curcas is being encouraged in Tamil Nadu under Comprehensive Wasteland Development Programme for bio fuel production and there by poverty alleviation. The Research Circle has identified high yielding plus trees for Jatropha curcas in the state. Totally 72 such high yielders were identified all over Tamil Nadu (Annexure III). An experiment was conducted to study optimum package of practices for cultivation of both clones and seed origin propagules as follows.

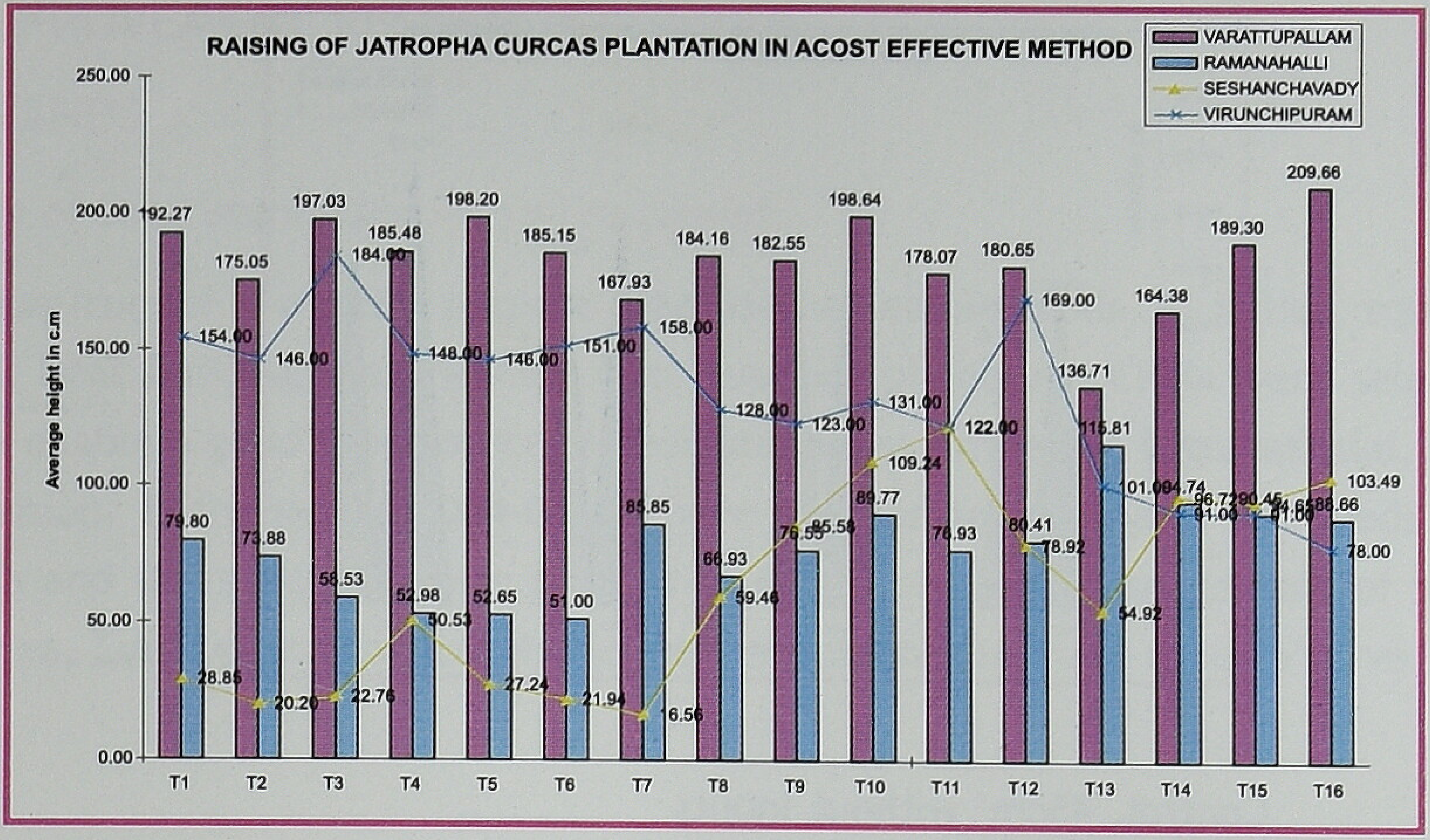
The experiment was taken up in different agro climatic zones in research centres namely Kolapakkam, Neyveli, Perungalathur, Harur, Alwarmalai, Arimalam, Lingamalai, Managathy, Seshanchavady, Virinchipuram, Ramanahalli, Vilamundi and Mettupalayam.

Arimalam, Trichy

SFRI, Kolapakkam

TREATMENT DETAILS FOR BAMBOOS CULTIVATION

Treatments	Seed based	Vegetatively	Espacement multiplied		Paclobutrazol		Bio fertilizer	
			1.5 x 2m	1 x 2m	Does 1	Does 2	Vermicasting-1ton/acre VAM-25g Azospirillum-10g Phosphobacteria-10g	Vermicasting-100g/pit VAM-25g Azospirillum-10g Phosphobacteria-10g
T1(C)	✓	—	✓	—	—	—	—	—
T2	✓	—	✓	—	—	—	✓	—
T3	✓	—	✓	—	✓	—	✓	—
T4	✓	—	✓	—	—	✓	✓	—
T5(C)	✓	—	—	✓	—	—	—	—
T6	✓	—	—	✓	—	—	✓	—
T7	✓	—	—	✓	✓	—	✓	—
T8	✓	—	—	✓	—	✓	—	—
T9(C)	—	✓	✓	—	—	—	—	✓
T10	—	✓	✓	—	—	—	—	✓
T11	—	✓	✓	—	✓	—	—	✓
T12	—	✓	✓	—	—	✓	—	✓
T13(C)	—	✓	—	✓	—	—	—	✓
T14	—	✓	—	✓	—	—	—	✓
T15	—	✓	—	✓	✓	—	—	✓
T16	—	✓	—	✓	—	✓	—	✓



outcome

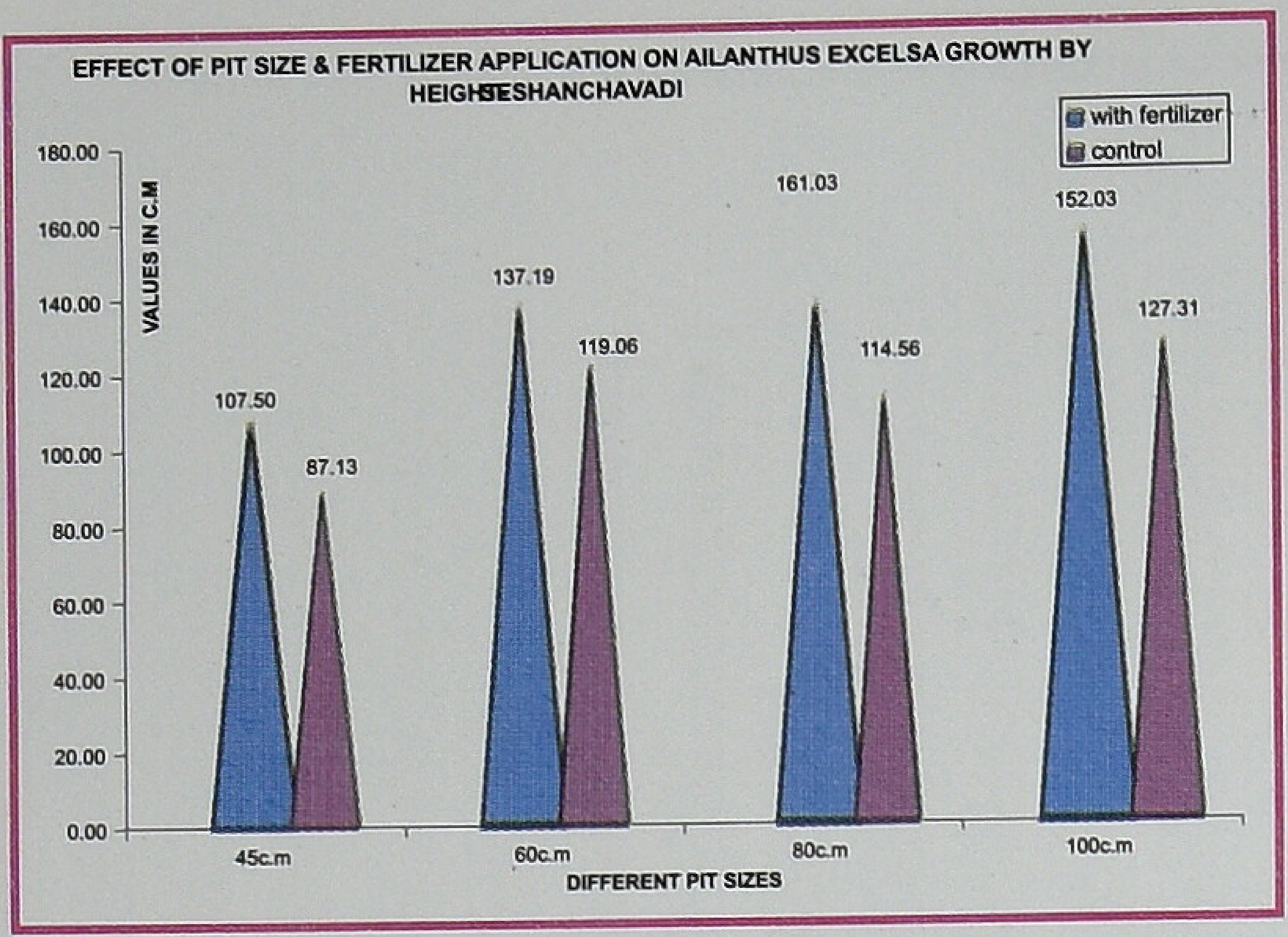
During the second year it was observed that the growth performance is very poor in Lingamalai due to alkaline nature of soil. Best performance in Arimalam and in Managathy Research centers Sparse yield is recorded.

5. Study on effect of pit sizes and bio fertilizers application for *Ailanthus excelsa* and *Melia dubia*

This experiment was carried out in Minor Forest Produce Research Division, Salem at Seshanchavady. *Ailanthus excelsa* is the main tree in demand for Match wood industry. Cultivation of *Ailanthus excelsa* is remunerative for the farming community. Melia dubia is a fast growing, good veneer wood tree and a good choice of energy wood species. To assess the optimum pit size and bio fertilizer dosage to produce maximum wood volume in *Melia dubia* and *Ailanthus excelsa*, different treatments were administered as follows

Different doses of bio fertilizers

Pit size	45cm^3	60cm^3	80cm^3
Vermicastings	200g	500g	1kg
VAM	25g	50g	100gm
Phosphobacteria	10g	20g	25g
Azospirillum	10g	20g	25g
Tricoderma viridii	5g	10g	15g
Pseudomonas	5	10	15



Treatments

T1	-	Control, 45cm^3 without inputs
T2	-	45cm^3 pit with bio fertilizers
T3	-	Control, 60cm^3 pit without bio fertilizers
T4	-	60cm^3 pit with bio fertilizers
T5	-	Control 80cm^3 pit without bio fertilizers
T6	-	80cm^3 pit with bio fertilizers

Outcome

Based on current measurements, the 80cm^3 pit size with bio fertilizer treatment was suitable for Ailanthus profitable cultivation.

6. Raising *Albizia falcatoria* under protective irrigation

Albizia falcatoria is the promising agro forestry tree utilized for constructing Catamaran. For cultivation of *Albizia falcatoria*, irrigation is essential. To raise *Albizia falcatoria* under protective irrigation condition to save water, an attempt was made by State Forest Research Institute, Kolapakkam and Agaram. Water regime followed was irrigating once in 15 days during non-rainy days for five years. *Albizia falcatoria* was planted in 2 pit sizes namely 80cm^3 and 1m^3 in an espacement of 3m x 3m. Bio fertilizers were applied to all the plants. 80Cm^3 pit (700g Vermicasting + 50g VAM + Rhizobium 20g + Phosphobacteria 20g), 1m^3 pit (1500g vermicasting + 250g VAM + Rhizobium 50g + Phosphobacteria 50g).

Outcome

During the second year it was observed that the average height of *Albizzia falcatoria* was under protective irrigation was good.

II. TREE IMPROVEMENT RESEARCH

i) SEED STANDS

1. Formation of seed stands for *Syzygium cumini*

Syzygium cumini is a multi purpose tree used as edible foods, in jellies, squash, timber for construction, boat building, cart wheels, etc. superior phenotype CPT's were selected at various locations. To enable a good seed source, a seed stand was formed at Pettavathalal, Industrial Wood Research Division, Trichy during 2004-05. To have a wider genetic base, the seeds were collected from 20 CPTs and the seedlings were planted in $60cm^3$ pits in an espacement of 5m x 5m and in peripheral area, *Eucalyptus tereticornis* clones were planted in three rows to serve as a vegetative barrier.

Outcome

Under observation.

2. Formation of seed stands for *Ailanthus excelsa*

Ailanthus excelsa is one of the most important match wood species having good market value, but the availability of good quality Ailanthus excelsa in market is inadequate. Hence15 Nos. of CPTs were identified in various locations and to have a better seed source a seed stand has been formed for Ailanthus excelsa at Sholapuram, Industrial Wood Research Division, Trichy and Bhavani sagar, Genetics Division, State Forestry Research Institute, Vandalur, Kolapakkam, Neyveli during 2004-05. The seedlings were planted in 4m x 4m espacement and in $60cm^3$ with bio-fertilizers namely poultry manure - 800 gms, VAM - 50 gms, Azospirilium - 25 gms phospho bacteria - 25 gms.

Outcome:

Growth rate is under observation.

3. Formation of *Casuarina junghuniana* seed stand for seed production

Casuarina junghuniana is a fast growing promising agro forestry species gaining popularity among farmers at Theri RF. It was found that *Casuarina junguniana* is a suitable species to stabilize the sand dunes and form vegetative cover. Hence to assemble Casuarina junguniana varieties and to form better seed source, this experiment was carried out at Thangachimadam and Pattakarai research centres, Industrial Wood Research Division, Trichy during 2004-05. Seeds were obtained from Australia for the following varieties and planted in $30cm^3$ pits in two espacements namely 1m x 1m and 1.5m x 1.5m.

Australian Varieties

1. Kapan Kupang
2. Camplog Timor
3. [R]Bautsoe Timor Indo

Bio-fertilizer doses

Vermicasting	- 250gms
VAM	- 40gms
Azospirillium	- 20gms
Phospho bacteria	- 20gms

6 months growth of Casuarina junghuniana in Thangachimadam

Outcome

After one year it was found that Camplog Timor varieties is performing better than the other two varieties in this tract. Any how the growth will be further observed.

4. Formation of seed stands for *Simaruba glauca*

Simaruba glauca is a well performing tree in State Forest Research Institute already introduced during 1998. To produce high quality seeds for further propagation a seed stand from seeds of 15 CPTs of Genetic division and 20 CPTs of State Forest Research Institute division, was established at State Forest Research Institute during 2004-05 in 2.5ha.

Seed stand of Simaruba glauca, Kolapakkam

5. Formation of *Simaruba glauca* seed stand under protected irrigation condition *Simaruba glauca* seed stand Bhavanisagar 2004-05

This experiment was conducted at Bhavanisagar, Genetic Division. Cultivation of *Simaruba glauca* in large scale has been taken up by farmers owing to the multi various utility of the tree. To identify superior varieties in the species and to create seedling seed orchard for producing bulk seeds, to meet the increasing demand a seed stand was raised using grafts from the following sources.

1. Bhavani sagar
2. Nagercoil
3. State Forestry Research Institute
4. Krishnagiri
5. Orissa

Simaruba glauca seed stand Bhavanisagar 2004-05

Intercropping with medicinal plants like Cassia, Senna was taken up. The trees were planted in 4m x 4m espacement in $80cm^3$ with bio-fertilizers.

Biofertilizer doses - $60cm^3$

Vermicasting-500g
VAM-100g
Phosphobacteria-50g
Azospirillum-50g

6. Establishment of Seed stand for *Melia dubia*

Melia dubia is a fast growing secondary timber performing better under protected irrigation most suitable for Agro forestry. The seed demand is constantly increasing and to build up a genetical seeds source to serve quality seed source a seed orchard of one ha was established at Mettupalayam Research Centre, Genetics Division, Coimbatore during 2004-05 with the seeds collected from 10 selected candidate plus trees. The trees were planted $60cm^3$ pits in an espacement of 5m x 5m.

7. Establishment of provenance seed stand for *Gmelina arborea*

Gmelina arborea is a multi purpose tree becoming popular for farmers. To provide quality seed source a seed stand was established in an area of one ha with the following provenances at Mettupalayam Research Centre, Genetics Division, Coimbatore during 2004-05.

1. Pollachi	5. Uttaranjal
2. Karnataka	6. Assam
3. Bangalore	7. Rooted cuttings
4. Sadivayal	8. Mixed

The trees were planted in 60 cm^3 in an espacement of 4m x4m. Vegetative barriers were formed by planting two rows of Eucalyptus species to control unwanted pollination from other inferior trees.

8. Establishment of seed stand for *Dalbergia latifolia*

Dalbergia latifolia is admired and cherished for its strength durability and gain through out the world. To serve good quality seeds a seed stand was established at Mettupalyam and Sarkarpathy Research Centres, Genetics Division, Coimbatore during 2004-05. Trees from different provenances like top slip candidate plus trees, Gudalur and Karnataka were planted in an espacement of 4m x 4m in 60cm^3 pits.

Outcome

The trees are establishing well.

9. Formation of seed stand for *Pterocarpus santalinus*

Ptercarpus santalinus Seed Stand 2003-04

Red sanders is an exportable wood widely used for making musical instruments. The varieties having fine grains are having more demand in market and hence genetically superior varieties were used for creating seed orchard at Vilamundy, Bhavani sagar, Genetics division, Coimbatore during 2004-05. Seedlings from Andhra Pradesh were procured and planted in 5 ha in 60cm^3 pits along with local varieties.

Ptercarpus santalinus Seed Stand 2003-04

Outcome

The seedlings are establishing well.

10. Establishment of seed stand for Neem

Neem is the multipurpose tree widely used for timber, oil. Neem oil is the base of soap, pesticides and drugs. The alkaloids present in the neem oil namely Nimbidin, Azadirachtin have excellent export value. Hence to get quality seeds for further propagation of this species and to maintain germplasm bank for plus trees Neem was planted in an espacement of 3mx3m in60cm^3 pits in an area of 1 ha at Agaram, State Forest Research Institute during 2004-05.

Establishmant of seed stand for Neem, Marakkanam - Cuddalore

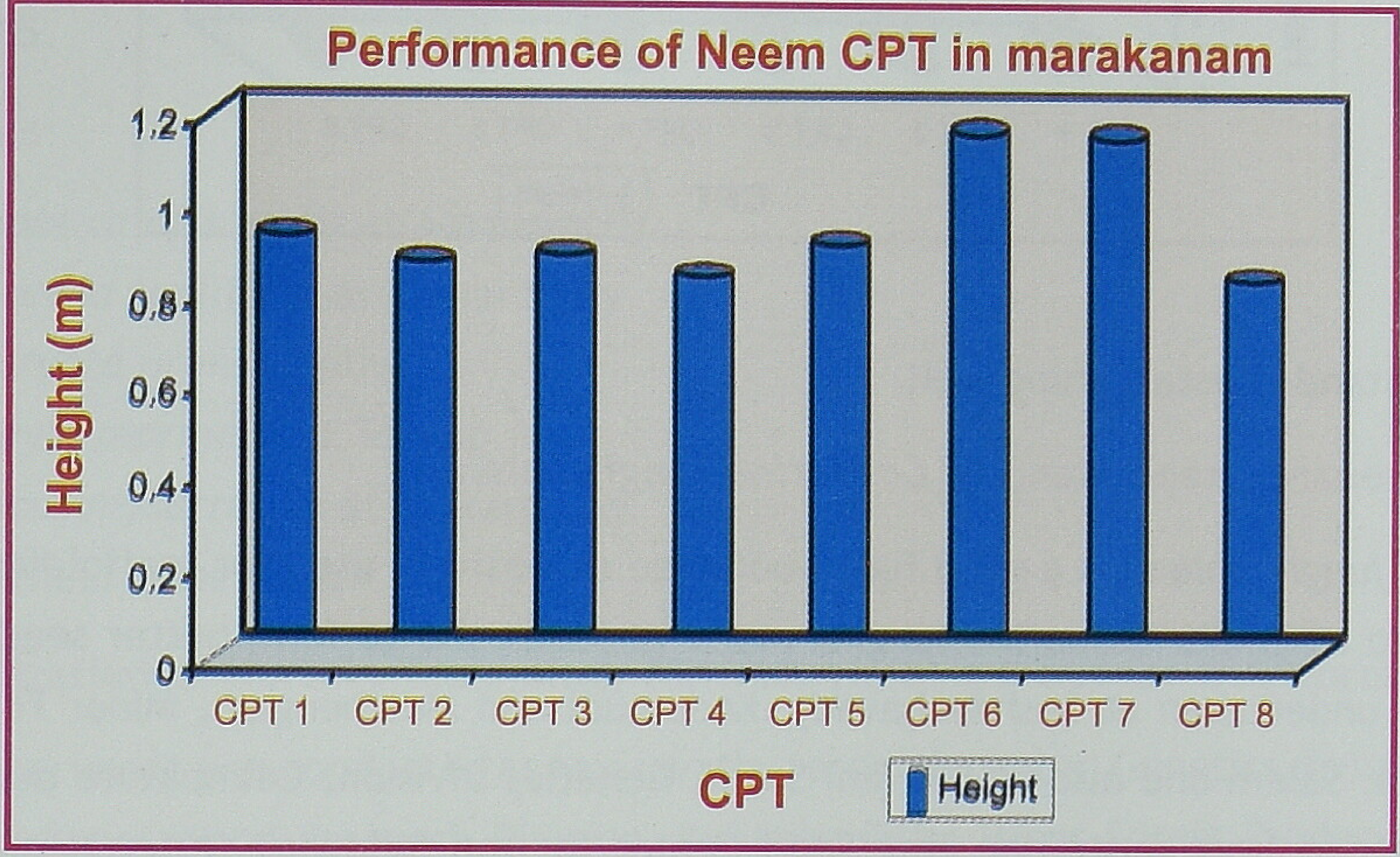
Biofertilizer doses

Vermicasting - 500g

VAM - 100g

Azospirillum-50g

Phosphobacteria - 50g



11. Establishment of seed stand for *Bassia latifolia*

Bassia latifolia is a fast growing species having a good economic value. Oil obtained from this species is the base for manufacture of soap, medicine and pesticide. Hence Bassia latifolia was planted in an area of 1 ha in60cm3 pits in an espacement of 3mx3m to get quality seeds for further propagation of this species and to serve as a germplasm bank. This experiment was conducted at Agaram, State Forest Research Institute during 2004-05.

Biofertilizer doses

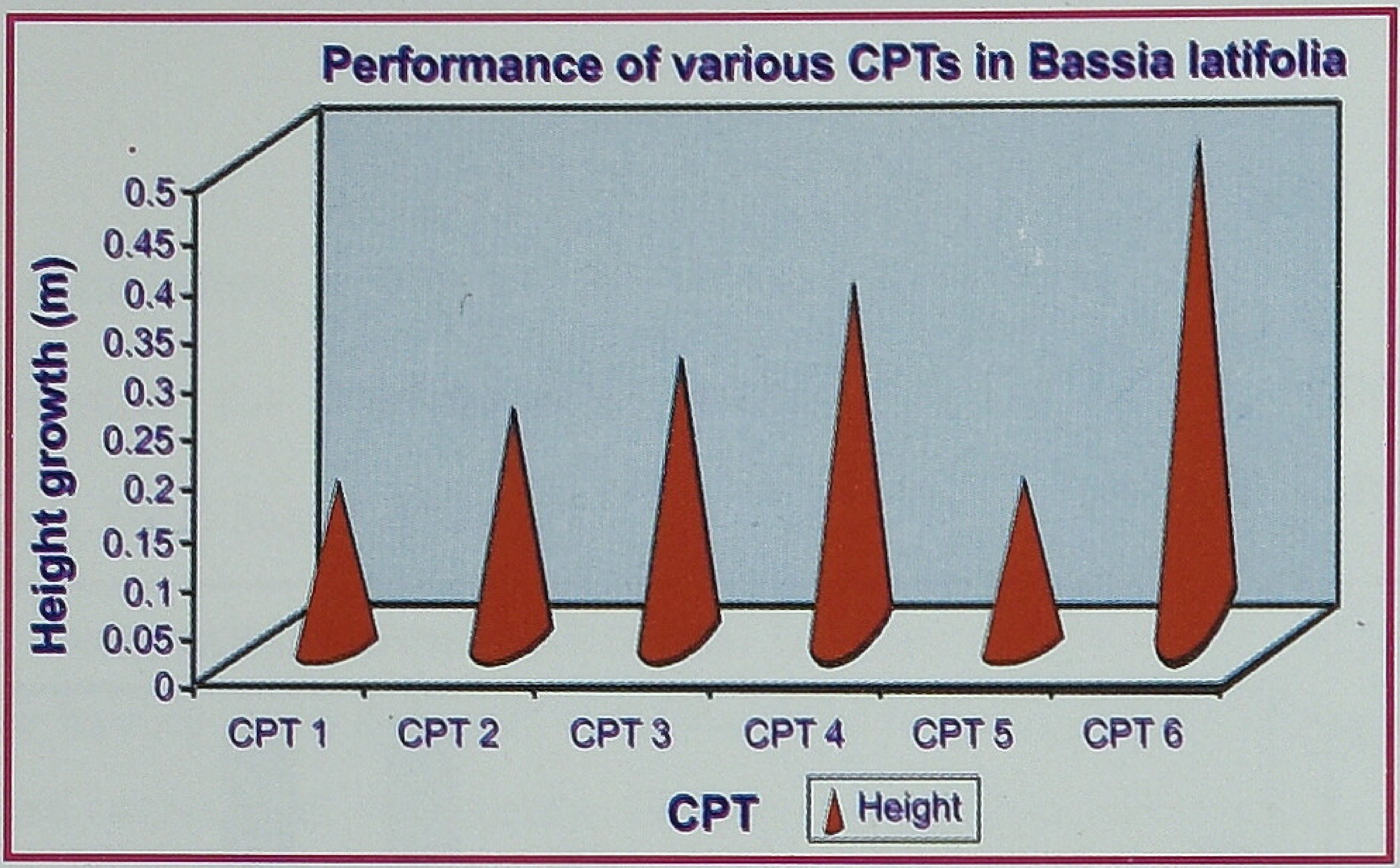
Vermicasting - 500g

VAM - 100g

Azospirillum - 50g

Phosphobacteria - 50g

Establishmant of seed stand for Bassia latifolia, Agaram - Cuddalore



Outcome

The seed stand is establishing well.

12. Raising provenance seed stand of *Casuarina junghuhniana*

Casuarina junghuhniana is a good fuel wood tree extensively used for scaffolding, centering, roofing. Hence to assemble Casuarina junghuhniana varieties and to form better seed source, this experiment was undertaken at Seshanchavady, Kodumudi and Melchengam, Minor Forest Produce Research Division, Salem and also at Bhavani Sagar, Genetics Division, Coimbatore during 2004-05. Seeds were obtained from Australian Tree Seed Centre for the following varieties and planted in $60cm^3$ pits in an espacement of 3m x 2m.

Raising provenance seed stand for Casuarina junghuhniana at Melchengam

Casuarina seed stand Bhavanisagar 2004-05

13. Developing Propagation technology for *Gmelina arborea* and *Pterocarpus marsupium*

Gmelina arborea is a fast growing multipurpose tree and *Pterocarpus marsupium* is a timber tree with medicinal value. The propagation of these two species are now being done through seeds. Since there is no assurance of transmission of genetic traits through seeds, clonal propagation was resorted to. From the 15 Gmelina arborea CPTs identified in Pollachi and Coimbatore, Clonal cuttings were collected and different proportions of IBA were used for raising the seedlings at Coimbatore Research Centre, Genetics division, Coimbatore during 2004-05. In the case of *Pterocarpus marsupium* the CMT trait was not successful.

Outcome

It was found that IBA 4000 gave positive results in case of *Gmelina arborea*

14. Developing propagation technology and nursery technology for species for food security.

In India, there are many numbers of species with unexploited potential for food and fodder. Seeds of few species were collected and made available to seed testing lab for developing seed technology. Following species were raised to standardize nursery technology and propagation technology at Topslip, Genetics division, Coimbatore, Hasthampatty, Minor Forest Produce Division during 2004-05.

List of Species

a) *Emblica officinalis* at Amaravathy
b) *Grewia tealifolia* at Sarkarpathy
c) *Caryota urens* at Aliyar
d) *Aegle mormalis* at Topslip
e) *Ficus mysurrensis* at Sarkarpathy
f) *Premna tomentosa*

15. Standardization of Nursery technology for fruit yielding trees for frugivorous birds

This experiment was conducted at Amaravathy research center, Genetics division, Coimbatore, Arimalam, Industrial Wood Research Division, Kurumbapatty, Minor Forest Produce Division during 2004-05. In the regeneration process one of the important factors is the plant animal interaction. Attracting frugivorous birds to regeneration sites will assess in the re-establishment of a functioning eco system. Fruit yielding trees usually attract frugivorous birds and seed dispersal in the very handy for effective regeneration. Information on which birds eat which particular fruit is very useful for the forest managers. Therefore about nine varieties of seedlings were raised during the 2004-05 at different centers as follows.

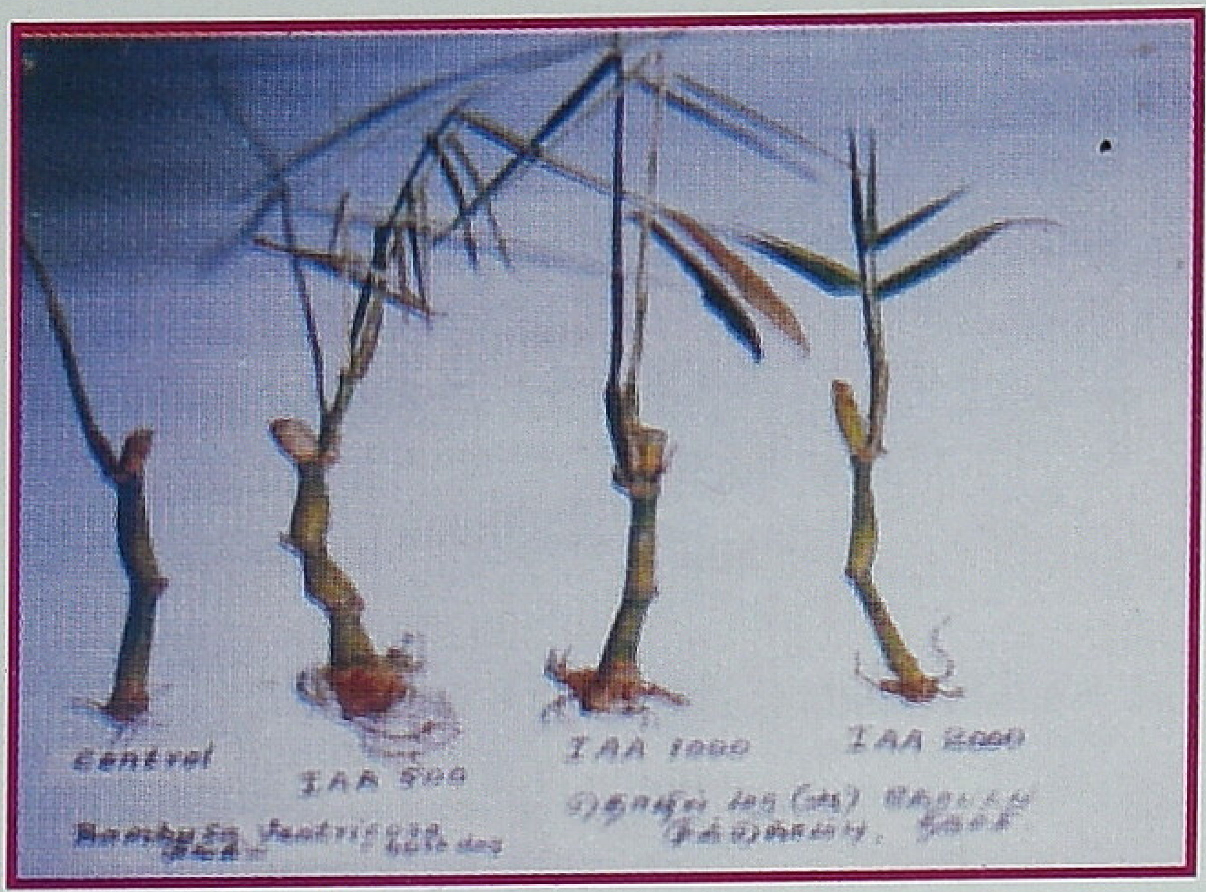
a) *Ficus bengalensis* - Sarkarpathy
b) *Ficus racemosa* - Sarkarpathy
c) *Terminalia bellerica* - Sarkarpathy
d) *Santalum album* - Amaravathy
e) *Syzygium cuminii* - Sarkarpathy

16. Standardization propagation technology for *Bambusa balcooa*

Standardizing propagation technology for Bambusa balcooa different soil media were tried at Amaravathy centre, Genetics division, Coimbatore during 2004-05.

1) Soil and Sand - 1:1 ratio
2) Soil, sand and vermicasting - 1:1:1 ratio
3) Soil, Sand and VAM - 1:1:1 ratio

Bamboo CMT - Amaravathy

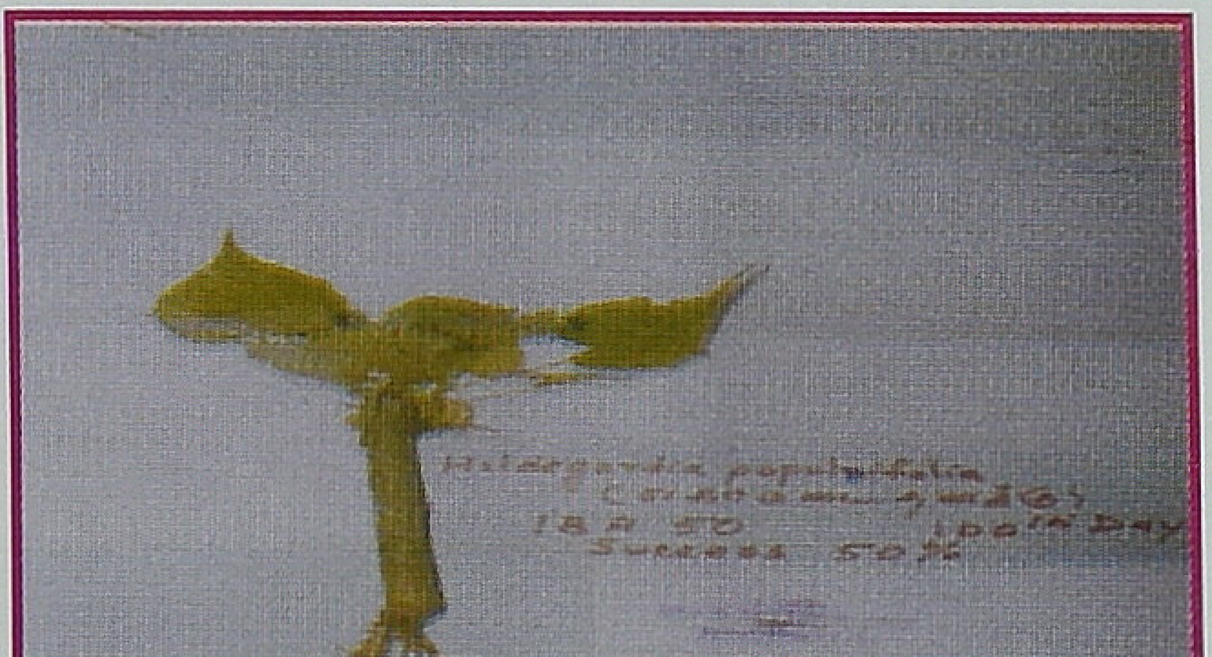


Outcome

The cuttings sprouted after 20 to 25 days, but there was no survival. The experiment will be repeated next year.

17. Standardization of Clonal propagation technology for important species

Different rooting hormones are used in general for clonally multiplying any species. An experiment was conducte at Mukkombu, Industrial Wood Research Division, Trichy to standardize the rooting hormone and its concentration as detailed below.



Eucalyptus pellida

Albizia richardiana

Ailanthus excelsa

Ailanthus excelsa

Suitable Auxin study for identified species

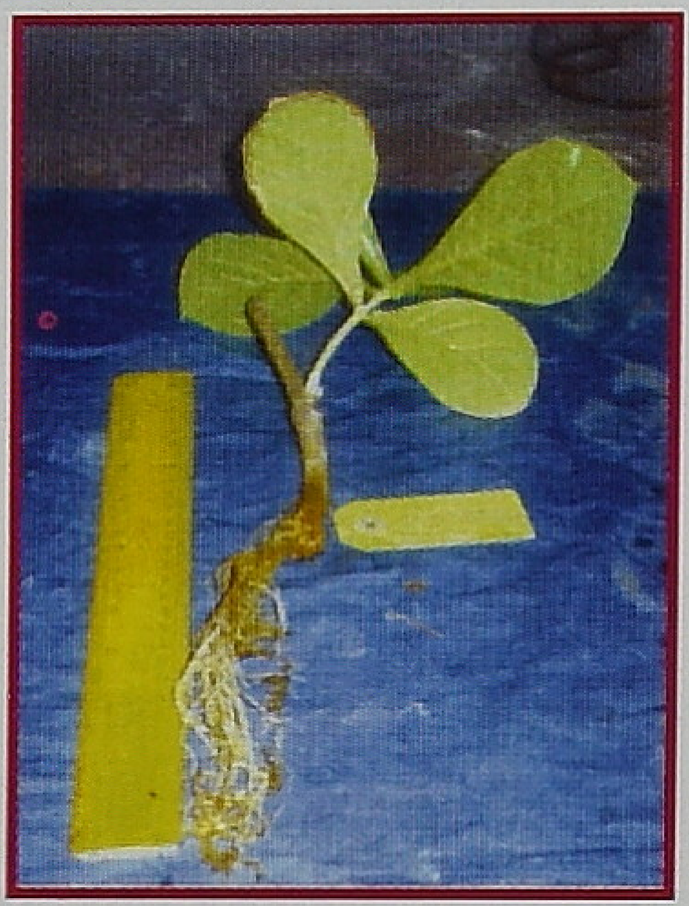
Rooting performance studies were conducted for identified species with various concentration of G.R.S. throughout the year. The results are tabulated below:

	Name of Species	Name of Auxin and its concentration	Total No. of cuttings tried	Source of cuttings	Rooting Tried months	Results
1.	*Tectona grandis*	IBA 100,200 IBA 500,1000 IBA 100+NaOH IAA 200,100 IAA 1000,2000 NAA 1000 NAA 2000 IBA 1000 + Thiamine	1000	Mukkombu Sholapuram	Through out the year	IBA 1000 + Thiamine gave 70% Rooting
2.	*Melaleuca alternifolia*	IBA 100, IBA 500 IBA 1000 IBA 4000,5000 IBA 10000 IAA 2000	1500	Arimalam siluvaicheri	Through out the year	Callous only noticed in IBA

3.	Nelli	IAA 100 IBA 100 IBA 200 IBA 500	75	Mukkombu Sholapuram	October	70% rooting in IBA 100
4.	Subabul	IBA 100 IBA 500 IBA 1000 IBA 2000 IBA 4000	500	Mukkombu	November February	75% rooting in IBA 1000 followed by 64% in IBA 4000
5.	*Casuarina Junghuniana*	IBA 1000 IBA 1500 IBA 2000 IAA 1500 IAA 2000 NAA 2000	600	M.R.Palayam Mukkombu	April August November	IBA 1500 gave 80% rooting

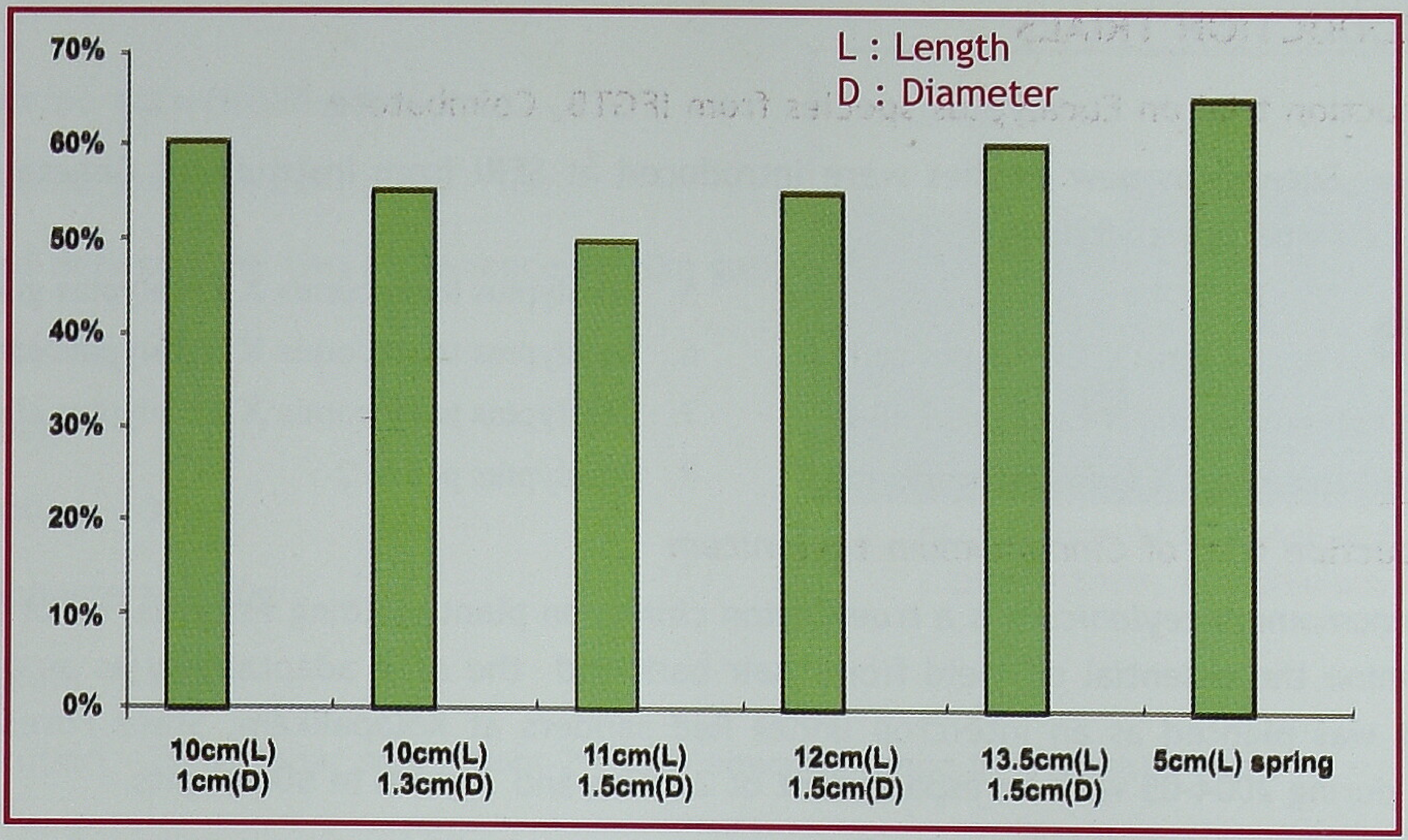
18. Standardization of Clonal propagation technology for Teak

Teak is a tree having foremost importance in the timber world. To ensure superior qualities in the offspring also, the identified superior phenotype tree has to be clonally multiplied. To standardize the mass multiplication with different root hormones and the concentration, the following treatments were tried.

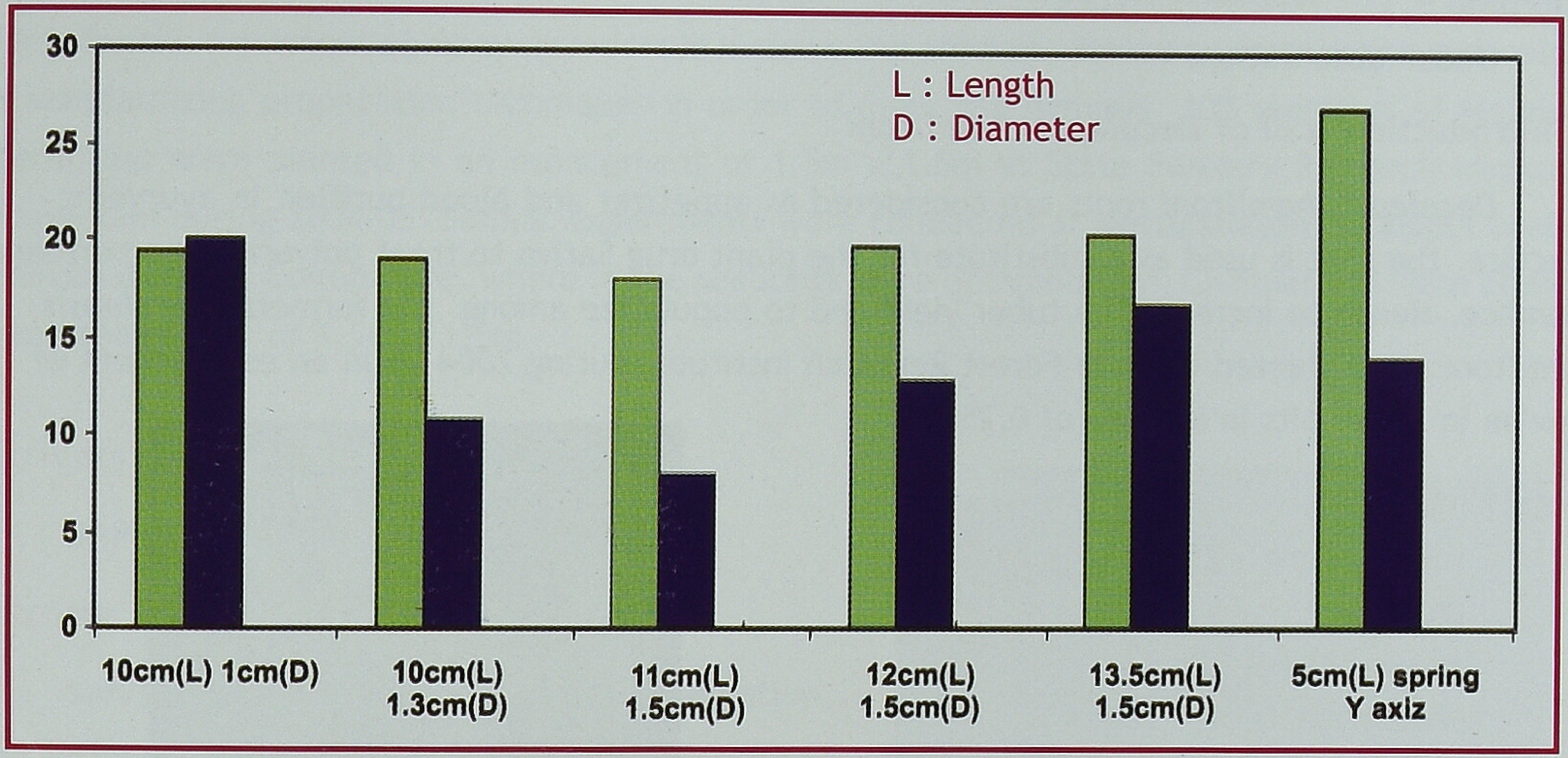


Root shoot formation in Teak - through cuttings

Size of cutting	Trial done (month)	Number of cuttings	Success of rooting		Root length (cm)	Shoot length (cm)	No.of Roots	Duration of Rooting
			Qty.	Percentage				
10cm 1cm	December	25	15	60	19.5	20	5	125 days
11 1.5	December	30	15	50	18	8	3	132 days
10 1.3	January	100	55	55	19	11	4	122 days
12.5 1.5	January	60	33	56	19.5	13	4	129 days
13.5 1.5	January	50	30	60	20	17	5	135 days



Effect of size of cutting on rooting (in percentage)



Effect of cutting sizes on shoot and root length in teak

Outcome

Cuttings with dia 1.0 to 1.8cm and a length of 10 to 17cm from the middle portion of the tree crown, dipped in the mixture of IBA 1000 + Thiamine 800ppm for 16 hours were tried and it was found that 10cm length with 1cm dia and 1.3cm dia cuttings produced better results in shorter period. Where in 13.5cm length with 1.5cm dia has also produced maximum result but took a longer rooting period.

ii) INTRODUCTION TRIALS

1. Introduction trial on Eucalyptus species from IFGTB, Coimbatore

Few Eucalyptus new species were introduced at SFRI from Institute of Genetics and tree breeding, coimbatore as follows :

1. ITC 3
2. Eucalyptus teretocornis X Eucalyptus pellita
3. Eucalyptus teretocornis X Eucalyptus alba
4. Eucalyptus teretocornis X Eucalyptus tereticornis
5. Eucalyptus teretocornis X Eucalyptus grandis
6. Eucalyptus teretocornis X Eucalyptus europhylla
7. Eucalyptus teretocornis X Eucalyptus alba 2
8. Eucalyptus pellita 2

2. Introduction trial of *Cinnamomum zeylanicum*

Cinnamomum zeylanicum is a true Ceylon cinnamon plant yielding essential oil of high value. To determine the essential oil yield from their bark and the area adaptability as an intercrop in plains, it was planted as an intercrop under Red sanders at Kolapakkam, State Forest Research Institute during 2004-05 with an espacement of 2mx2m and 3mx3m in 60cm^3 pits.

Biofertilizer doses-60cm^3

Vermicasting - 500g
VAM - 50g
Azospirillum - 20g
Phosphobacteria - 20g

Outcome

Under observation.

3. Introduction trail of *Decalepsis hamiltoni*

Decalepsis hamiltoni roots are considered as appetizer and blood purifier. In ayurvedic practice, the root is used as a substitute for the plant drug Sariva to treat polyuria, haemorrhage, jaundice. Hence to increase the tuber yield and to popularize among the formers, *Decalepsis hamiltoni* were planted in State Forest Research Institute during 2004-05 in an espacement of 2mx1m in 30cm^3 pits in an area of 0.25 ha.

Biofertilizer doses

Vermicasting - 250g
VAM - 25g
Azospirillum - 20g
Phosphobacteria - 20g

Outcome

Tuber size is observed.

Decalepis hamiltonii

4. Introduction of *Casuarina junghuniana* (Timur) provenance

Farmers along the coastal belt of Tamil Nadu undertake planting of *Casuarina junghuniana* as a commercial crop. Hence to find out the best performing varieties of *Casuarina junghuniana*, different provenance seeds were obtained from genetic division Coimbatore and were planted in an espacement of 1.5mx1.5m in 45m^3 pits in an area of 0.5 ha in SFRI, Kolapakkam and Neyveli during 2004-05.

Timur Provinence 1 : Buatsoe - clone No.19491, Lot No.26-(300 seedlings)

Timur Provinence 2 : Complong - clone No.19490, Lot No.27-(500 seedlings)

Control

1. *Casuarina euisetifolia*-100
2. *Casuarina junghuniana* (male) - 100

(planted between the two provenance at 10m gap)

Vermicasting - 250g

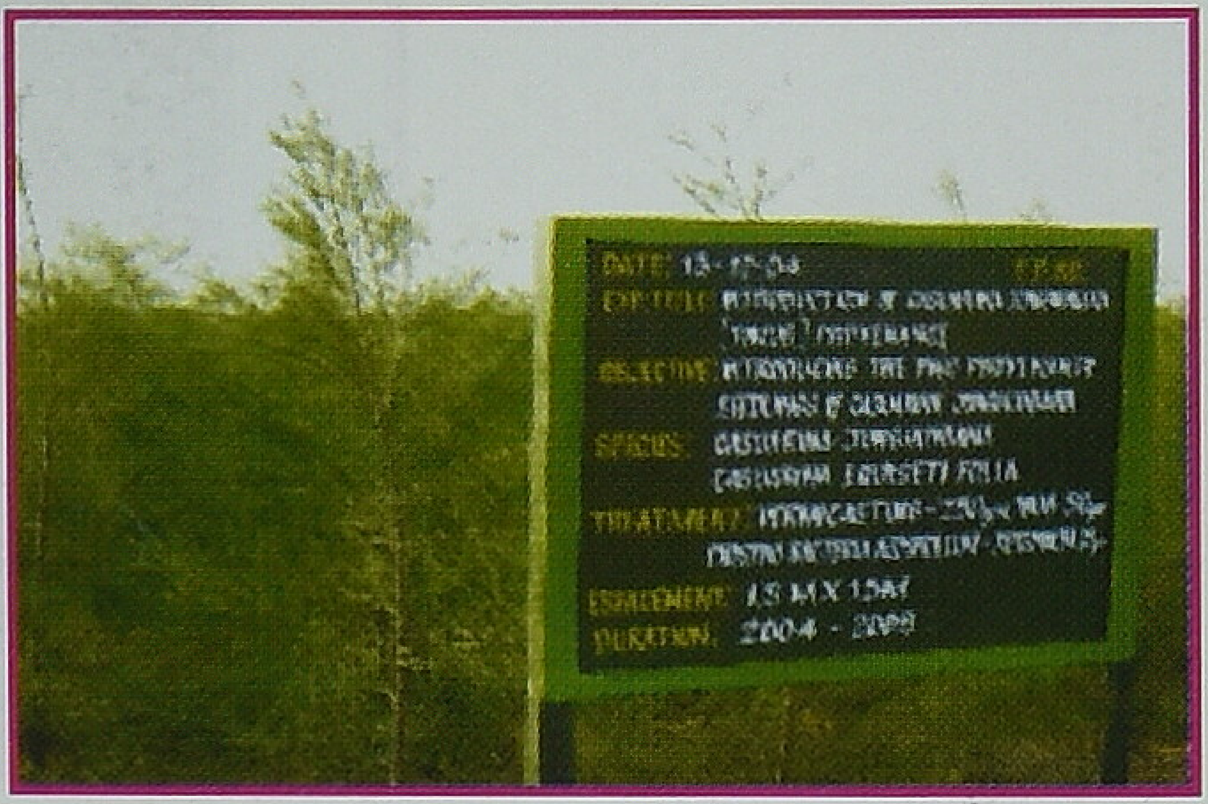
VAM - 50g

Azospirillum - 20g

Phosphobacteria - 20g

Rhizosbium - 20g

DAP solution - 2% as foliar spray from 2nd year onwards (once in a week)



Introduction of C. jungluniana provenance, Kolapakkam

Outcome

Growth rate is under observation

5. Introduction trial of *Melaluca alternifolia*

The oil from leaves of *Melaluca alternifolia* is extensively used in pharmaceutical industries to treat cuts and skin infections and as an anti fungal medicine. Tree oil (melaluca oil) is marketed widely for the treatment of many disorders in humans and animals. Hence to develop the technology for standardizing propagation techniques in order to meet the demand, 100 seedlings of *Melaluka alternifolia* were planted in an espacement of 1.5m x 1.5m at State Forestry Research Institute, Kolapakkam during 2004-05. Similar experiments were conducted at Mettupalayam, Thoppur center, Genetics division, Coimbatore, where in the seedlings were obtained from Chennai and were planted in an espacement of 1.5m x 1.5m.

Nutrients:

DAP-100g

Outcome

Survival and growth rate is under observation.

Mrlaluca alternifolia - introduction trial Kolapakkam

6. Assemblage of tree species suitable for packing case industry

An attempt was made to introduce suitable tree species for packing case industries at Arimalam, Industrial Wood Research Division, Trichy during 2004-05 and to study the both performance in this agro climatic zone. The species namely *Alstonia scholaris, Terminalia bellerica, Gyrocarpus jacquini, Delonix elata* and *Ailanthus excelsa* were planted in 60cm^3 pits in 4m x 4m spacing. Following treatments were administered.

7 months growth of Alstronia scholaris in Packing case experiment plot in Arimalam Research Centre

Treatments

Treatment	Vermicasting	VAM	Azospirillum	Phospho bacteria	Poultry manure
T1	400	60	30	30	-
T2	-	-	10	10	400
T3	Control	-	-	-	-

7. Introduction trial of *Kaya senegalensis*

Kaya senegalensis is a very good timber and veneer yielding species commercially known as African Mahogany. Kaya senegalensis was planted at an espacement of 3mx3m in 60cm^3 pits to assess the suitability of this species for our locality and to study their growth performance with reference to espacement and pit size. This experiment was conducted at Gopachandram, Melchengam, Lokur and Varattupallam Minor Forest Produce Research Division, during 2004-05.

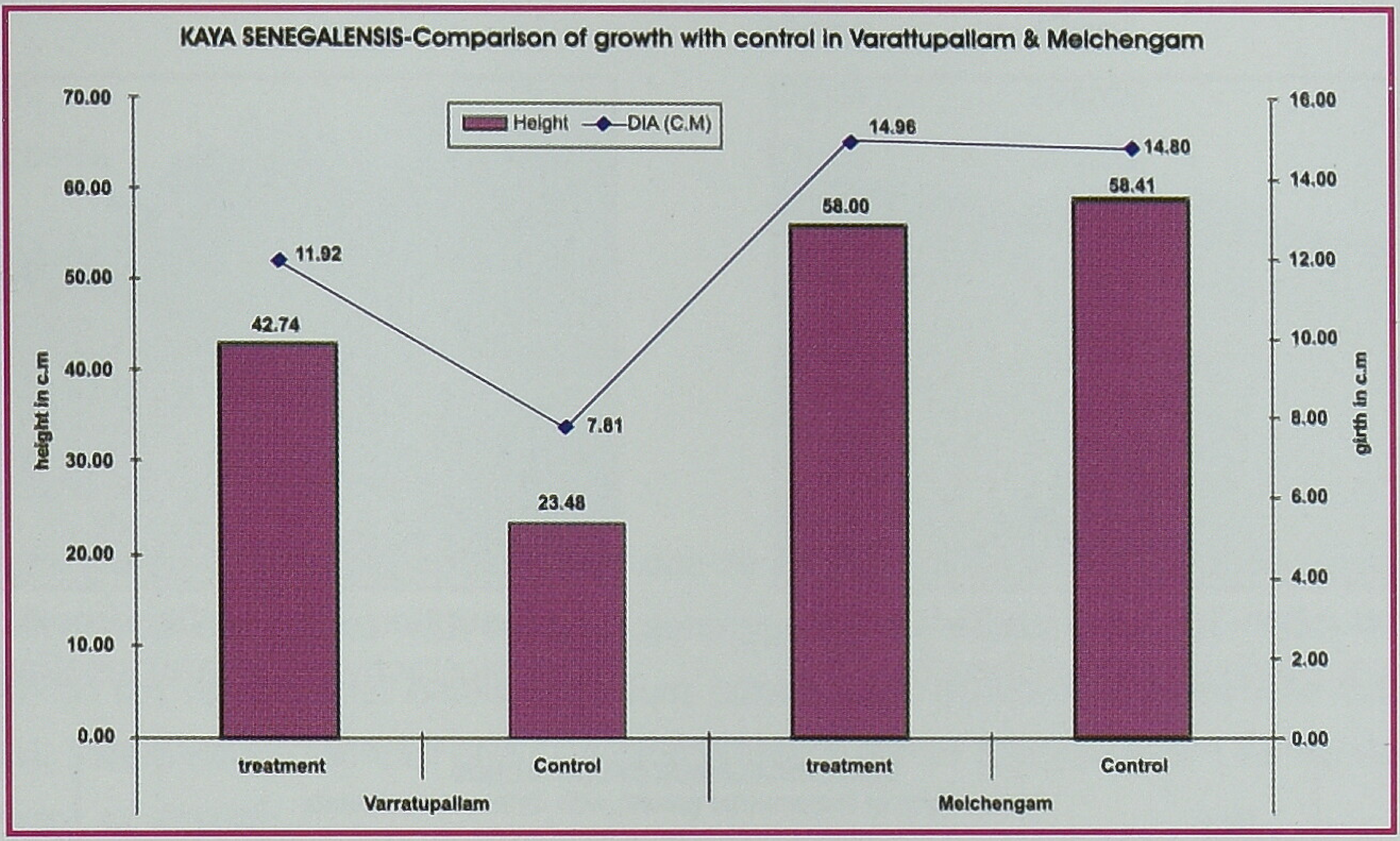
Bio-fertilizer doses:

Poultry manure-400g
Vermicasting - 400g
VAM - 60g
Azospirillum - 30g
Phosphobacteria - 30g

Introduction Trial on Khaya senegalensis at Gopachandram

Introduction Trial on Khaya senegalensis at Melchengam

Introduction Trial on Khaya senegalensis
at Varattupallam



Outcome

Growth rate is under observation

8. Introduction trial of *Dendrocalamus calostachyus*

Dendrocalamus calostachyus is a tufted large bamboo used for domestic purposes and small buildings. Seedlings were brought from Forest Genetic Division, Coimbatore and planted in an area of 0.4 ha in an espacement of 5mx5m in Melchengam, Lokkur and Varattupallam of Minor Forest Produce Research Division, Salem during 2004-05, to asses the suitability of this species for our climatic condition.

Treatment

T1-biofertilizer doses

Vermicasting - 500g

VAM - 60g

Azospirillum - 30g

Phosphobacteria - 30g

Rhizobium-30g

T2-biofertilizer doses

Vermicasting - 500g

VAM - 60g

Azospirillum - 30g

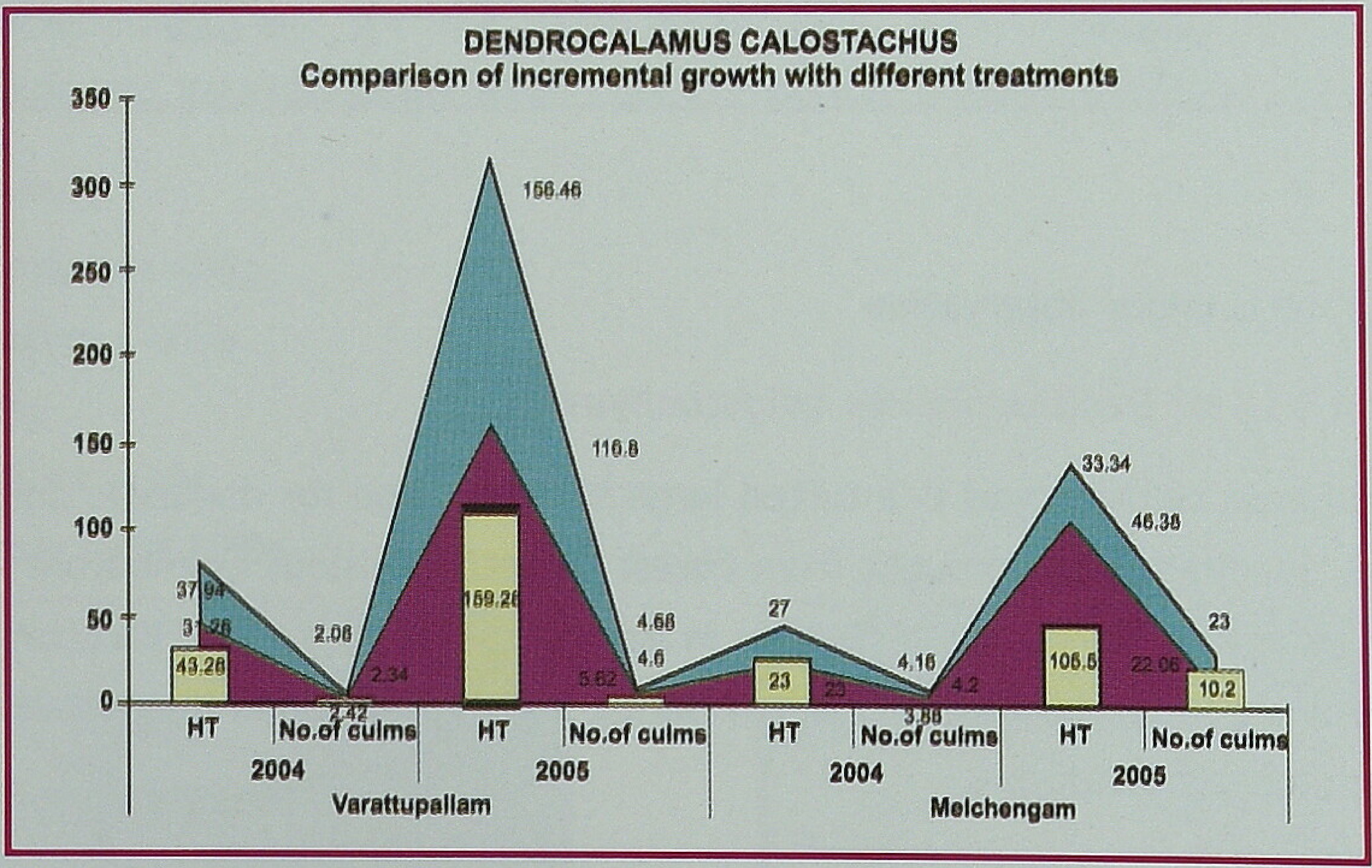
Phosphobacteria - 30g

Rhizobium-30g

T3-Control

Introduction Trial on Dendrocalamus calostachyus at Melchengam

Introduction Trial on Dendrocalamus calostachyus at Varattupallam



Outcome

Growth rate is under observation

9. Introduction trial of *Acacia elata*

Acacia elata is a very good timber yielding species. In order to meet the demand of timber for furniture for middle class people secondary timber like Acacia elata were planted. To asses the

suitability of this species to Indian condition and to assess the growth performance with reference to espacement Acacia elata were planted in an area of 1 ha in 60cm3 pits with different espacement like3mx3m, 4mx4m, 5mx5m at Chitteri, Minor Forest Produce Research Division, Salem during 2004-05. Similarly introduction trial of Acacia elata was taken up at Erumadu, Genetics division, Coimbatore with 3 provenances namely local variety, Kingston lot No. 29, Kingston lot No. 25, in 45cm^3 pits to compare and assess the performance.

Bio-fertilizers per pit (gms)

	Dose1	Dose2	Dose3	Dose4(control)
Poultry manure	-	250gms	200gms	200gms
Vermicastings	-	250gms	–	–
VAM	-	–	30gms	40gms
Azospirillum	-	–	10gms	20gms
Phosphobacteria	-	–	10gms	20gms
Rhizobium	-	–	30gms	30gms

Outcome

Growth rate is under observation.

10. Assemblage of Sandal Clones

Santalum album became endangered due to its good oil content in their wood with great fragrance. Hence sandal clones with superior genotype for increased yield, for mass multiplication were raised to set up a clonal banks *Santalum album* were planted in Seshanchavadi, Maragata, Kurumbapati, Salem Range, Minor Forest Division during 2004-05 in an area of 1 ha in 60cm^3 pits with an espacement of 4mx4m.

Bio-fertilizer doses

Vermicasting - 500g

VAM - 75g

Azospirillum - 20g

Phosphobacteria - 20g

Outcome

Growth rate is under observation.

11. Introduction trial of *Ceasalpinia sappan*-Mettupalayam

Totally 50 seedlings of *Ceasalpinia sappan* was planted during Oct 2004 at Mettupalayam Research Centre of Genetic Division, Coimbatore in an area of 500 m^2 in 60cm^3 pits with an espacement of 3mx3m. It is a medicinal and dye yielding plant, known as East Indian Red Wood. Used in phatma, dyes, food, textiles, handicrafts, drinking water purification etc. The tree fas developed high market value recently.

12. Introduction trial of *Swietenia mahogany*

Swietenia mahagony

Swietenia mahogany is one of the important timber species where the wood is used for various ornamental works, sculptures, ship making, plywood etc. and the bark is used in medicine. The dry leaves contain 15% tannin and gum is also found to be economically important. Therefore the species was introduced in Mettupalayam centre, Genetics Division 2004-05. The seedlings were raised from already existing plantation at Sadivayal and were planted in $60cm^3$ pits with Vermicasting 400gms, VAM 60gms, Azospirilium and Phospho bacteria 30gm each in an espacement of 4m x 4m in an area of 0.2 ha.

13. Introduction trial of New Eucalyptus Species

To find out the pulpwood value, timber value and oil content, volume increment and growth rate of the following new eucalyptus species, an experiment was conducted at Erumadu, Genetics division, Coimbatore during 2004-05.

1. *Eucalyptus astringens*
2. *Eucalyptus diversicolor*
3. *Eucalyptus oleosa*
4. *Eucalyptus salmanopholia*
5. *Eucalyptus marginata*

14. Introduction trial of *Simaruba glauca*

Simaruba glauca Is an oil bearing tree economically important already cultivated in plains. To assess the performance in middle elevation, high rainfall area it was introduced at Erumadu, Genetics division, Coimbatore during 2004-05 in an area of 0.5 ha in 4m x 4m espacement.

15. Introduction trial of *Kaya anthotheca*

Kaya anthotheca is a multi purpose tree species suitable for different climatic conditions and it was obtained from Australia and planted in Sholapuram, Cauvery delta zone in $60cm^3$ pits with an espacement of 4m x 4m to study the performance in this agro climatic zone. Similar introduction trial was conducted at Erumadu, Genetics division, Coimbatore, Seshanchavadi, Varatupallam, Melchengam and Maragatta, Minor Forest Produce Research Division, Sholapuram, Industrial Wood Research Division, Trichy during 2004-05 at 3m x 3m espacement in $60cm^3$ pits in an area of 0.4 ha.

Introduction Trial on Khaya anthotheca
at Varattupallam

Introduction Trial on Khaya anthotheca
at Melchengam

Introduction Trial on Khaya anthotheca
at Sheshanchavady

Outcome

It was found that the growth rate is very low. Any how the experiment is under observation.

16. Formation of Arboretum for important timber yielding tree species

This experiment was conducted to identify the suitable tree species, for changing unproductive fallow lands to productive lands and to find out the suitable silvicultural practices for that species. Around 50species, 20 plants for each species were planted in an espacement of 3mx3m in 1ha in State Forestry Research Institute, Kolapakkam during 2004-05.

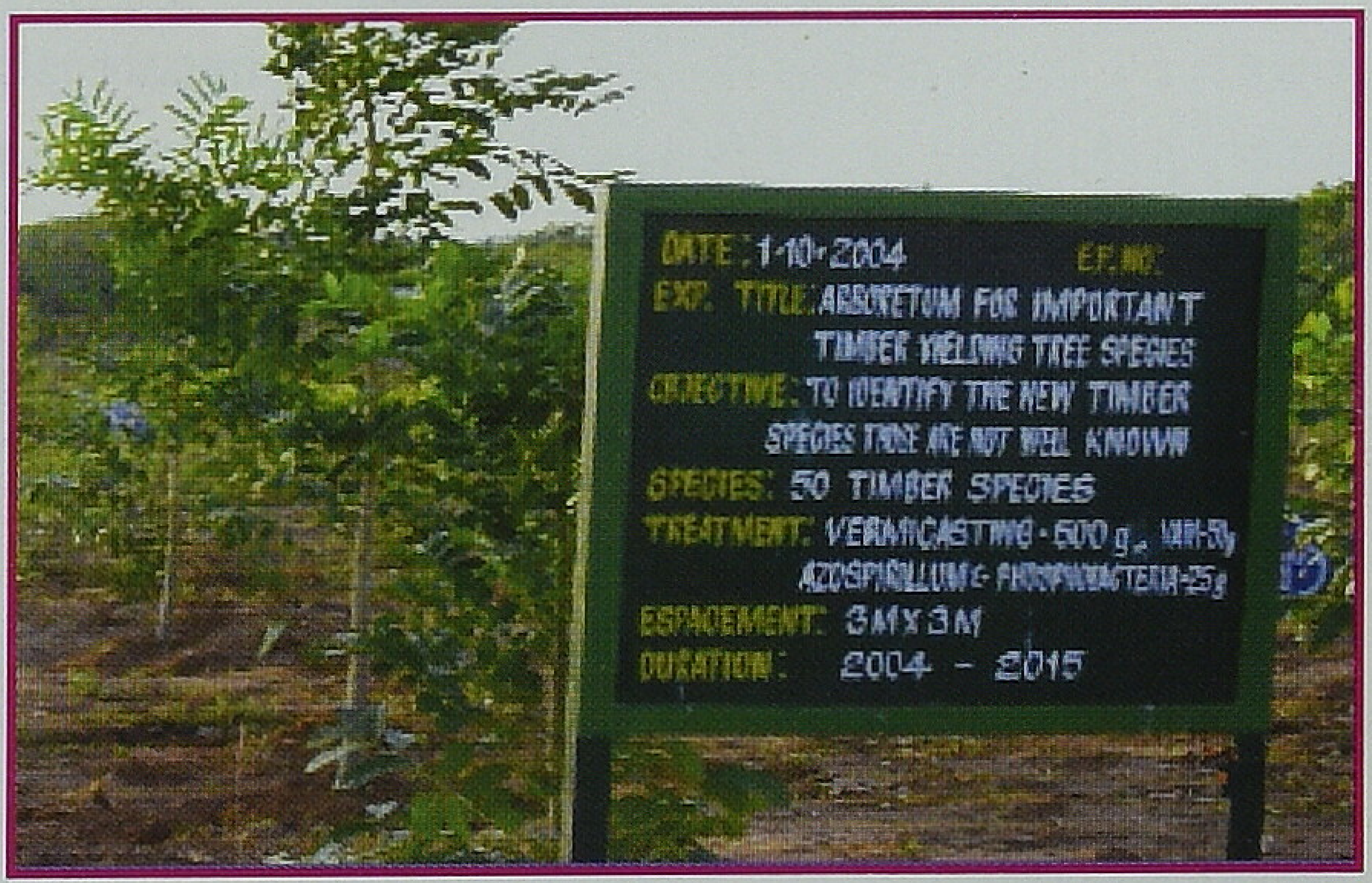
Biofertilizer doses

Vermicasting - 50g

VAM - 25g

Azospirillum - 25g

Phosphobacteria - 25g



Arbotatum of important timber sp
Kolapakkam

17. Provenance trial of Andhra Pradesh Tamarind clones

Tamarind clones start yielding fruits from 4th year onwards unlike tamarind seed origin trees which take 5 to 6 years to yield. Farmers opt for tamarind clones since they can realize the benefit early. Therefore at State Forest Research Institute, Kolapakkam 18 varieties of tamarind clones from Andhra Pradesh where brought and raised to assess the suitability to this agro climatic zone. The clones were planted during 2004-05 in $1m^3$ pits with 1.5kg Vermicasting, 100gm VAM, Rhizhobium and Phospho bacteria each 50gms in an espacement of 5m x 5m.

Outcome

All the clones are performing on par. It is under further observation.

iii. HEDGE STOOL

1. Formation of Hedge stool for *Melia dubia*

Hedge stool techniques for multiplication of imperior quality best performing planting material can help in increasing productivity. To develop large scale multiplication gardens for providing basic planting material to meet the demand a Hedge stool was formed at Amaravathy, Genetics division, Coimbatore during 2004-05.

Outcome:

The Hedge stool has established well.

Melia dubia Hedge stool
Amaravathy 2004 - 05

2. Formation of Hedge stool for *Alnus nepalensis*

Alnus nepalensis is a fast growing match wood species with good market demand. To enable vegetative propagation, a hedge stool was formed with CPTs identified in Kodaikanal. In an area of 0.5 ha with an espacement of 3m x 3m Alnus nepalensis was planted during 2004-05 at Guntar, Kodaikanal, Industrial Wood Research Division, Trichy in $60cm^3$ pits with following dose of bio-fertilizers such as Vermicasting - 400gms, VAM - 60gms, Phospho bacteria - 30gms.

Alnus nepalensis

Outcome

Growth rate is under observation.

3. Formation of Hedge stool for *Casuarina junghuniana* (Male sterile)

The species *Casuarina junghuniana* is a male sterile species propagated vegetatively to produce clonally propagated seedlings in large scale a hedge stool garden was formed at State Forest Research Institute, Kolappakkam during 2004-05 to provide a base material for clonal propagation. Clonal seedlings from 100CPTs were obtained and planted in an espacement of 1.5mx1.5m, in 60cm³ pits.

Biofertilizer dose:

Vermicasting -400g

VAM - 60g

Azospirillum - 30g

Phosphobacterium - 30g

Hedge stool in Casuarina, Kolapakkam

4. Formation of Clonal Multiplication Area for *Tectona grandis*

Teak and Rose wood are recognized for timber qualities. To evaluate best quality clones, to give quality timber and maximum yield, an experiment was conducted by planting selected plus trees, to serve as source for clonal material for vegetative propagation at Bhavani Sagar, Genetics division, Coimbatore during 2004-05. The following clones of teak were planted and clonal multiplication was done by cutting selected trees.

Teak Clones:

1 to 8 : Anthiyur

9 to 36 TNT 1 to 36

37 to 40 Andhra pradesh (AKD)

40 to 44 Kerala (KLS) & KLN

Seedlings are under establishment.

Teak Hedge stool bhavanisagar 2004-05

5. Clonal evaluation trial on Teak at Vaigai river bank

Teak is one of the most valued timber species in forestry. It was found that the performance of teak on river / canal banks is better and the yield is more. Hence 15 teak clones evolved already were tried on the vaigai river canal bank. Teak clones were TNFRT - 1 to 7 (Thoonakkadavu clones), TNFRA - 8 to 15 (Andhiyur clones). They were planted during 2004-05 in 3m x 3m espacement in 60cm3 pits with and without bio-fertilizers, Vermicastings - 250gms , VAM - 40gms, Azospirillium - 20gms, Phospho bacteria - 20gms. The performances of clones were evaluated by comparing with seed origin teak.

Outcome

Under observation

6. Development of propagation technique for *Mimosops elengi*, *Celastrus paniculatus*

Both species have medicinal importance to restore the population and to enable mass production, clonal propagation methods were standardized at Coimbatore Genetic Division. Clonal cuttings of *Mimosops elengi* were collected from Deputy Conservator of Forests campus avenue plantation. *Celastrus paniculatus* clonal cuttings were procured from Deputy Conservator of Forests residence at Ram Garden. Mimosops cuttings were kept under mist tent in IBA 4000 and 5000. Success rate is observed more in IBA 400. For *Celastrus paniculatus*, cuttings were treated with IBA 4000 and 5000. But IBA 4000 seems to be promising, About 160 seedlings of *Mimosops elengi* were multiplied and kept in the nursery during 2004-05.

b) Ongoing Experiments - Tree Improvement

1. Assemblage of Veneer yielding trees

The plywood industry is facing difficulty due to shortage of traditional timbers for manufacture of plywood and Veneer. Therefore, to find out the suitability of different Veneer yielding species for various agro climatic zone, during 1999-2000 at State Forest Research Institute, Kolapakkam, some important veneer yielding trees were assembled in 3m x 3m espacement namely Kaya senegalensis, *Sweitenia macrophylla, Thespesia populnea*, and *Sweitenia mahagony*. Among these trees Kaya senegalensis is performing better with an average height 6.5m and average girth of 9cm.

Assemblage of Veneer yielding tree sp (Gmelina arborea) Kolapakkam

At Pallakulam Research centre and at Melakkadu centre at Industrial wood division Trichy, different Veneer yielding trees were tried during 2000 with different treatments.

At State Forest Research Institute, Kolapakkam, the following species were raised, during 2003-04 to find out the suitability of Veneer yielding species in $30cm^3$ pits.

1. *Acrocarpus fraxinifolius*
2. *Melia dubia*
3. *Albizia richardiana*
4. *Alstonia scholaris*
5. *Albizia procera*
6. *Simaruba glauca*
7. *Ailanthus malabaricum*
8. *Albizia falcatoria*
9. *Anthocephalus cadamba*
10. *Ailanthus excelsa*
11. *Hibiscus tiliaceous*
12. *Populus deltoides*
13. *Gmelina arborea*

Treatments

Espacement	Vermicasting	VAM	Azospirillum	Phosphobacteria
3m x3m	1.5 kg	100g	50g	50g

Outcome:

It was observed in the second year that *Gmelina arborea* and *Melia dubia* are fast growing and performing better compared to other species. The experiment is under observations.

2. Assemblage of dye yielding species

There are more than 250 species of dye yielding species in Tamil Nadu. Of late, the dye industries are in search of natural dyes as alternatives to chemical dyes due to environmental pollution and due to market trends in demand. Over the years in various research centres different dye yielding species have been assembled. At Arimalam and Kolapakkam research centres during 2002-03 some promising dye species were planted in a pit size of $45cm^3$ with an espacement of 2m x 2m.

Evaluation of dye yielding tree sp, Kolapakkam

During 2003-04 to find out suitable dye yielding plants for North-Eastern zone, an experiment was taken up by State Forest Research Institute, Kolapakkam. Twenty five number of seedlings in each of the following species were planted in 3m x 3m espacement in $1m^3$ pits with bio fertilizers like Vermicasting 1.5kg, VAM 100g, Azospirillum / Phosphobacteria 50g each.

List of species assembled during 2003-04 (State Forest Research Institute)

1. *Aeagle marmelos*
2. *Terminalia catappa*
3. *Butea monosperma*
7. *Punica granatum*
8. *Syzygium cumini*
9. *Caesalpinia coriari*

4. *Caesalpinia sappan*
5. *Lawsonia inermis*
6. *Pterocarpus marsupium*
10. *Bixa orallena*
11. *Acacia sundra*
12. *Ferronia elephantum*

Sl.No.	Species	Av. Ht (m) after 15 months	Sl.No.	Species	Av. Ht (m) after 15 months
1.	*Aegle marmelos*	2.35	7.	*Punica granatum*	1.60
2.	*Acacia catappa*	1.20	8.	*Syzygium cumini*	1.60
3.	*Butea monosperms*	1.00	9.	*Caesalpinia coriaria*	2.00
4.	*Caesalpinia sappan*	2.20	10.	*Bixa orallena*	1.80
5.	*Lawsonia inermis*	1.60	11.	*Acacia sundra*	2.60
6.	*Pterocarpus marsupium*	2.75	12.	*Feronia elephantum*	0.75

Outcome

It was observed in the second year that *Pterocarpus marsupium* and *Acacia sundra* are out performing other species and establishing well.

3. Formation of seedling seed orchad cum progeny trial for the Match wood species

There is growing demand from match wood industries for match splints and match boxes. The wood for match production is in continuous short supply.

There is tremendous scope for promotion through agro forestry in Tamil Nadu. Therefore to improve the yield and to obtain good quality of matchwood, an Experiment was undertaken at Pallakulam, Melakkadu and Arimalam Research centres of Industrial Wood Research Division, Trichy during 2003-04. The Match wood species namely *Albizia falcatoria, Ailanthus malabaricum, Simaruba glauca, Populus deltoides, Ailanthus excelsa* were raised in different pit sizes of 40cm3, 60cm3 and 80cm3 with and without application of bio fertilizers. *Ailanthus malabricum* seeds were obtained from Kerala Forest Department, Simaruba glauca seedlings were raised from the CPT's of Pallakulam assemblage. *Albizia falcatoria* was collected from superior trees of Paechipparai plantations. The espacement adopted was 5m x 5m for *Simaruba glauca* and 3m x 3m for *Albizia falcatoria* and for the rest of the species raised.

18 months growth of Ailanthus exceisa in 60 cm^3 pit - Melakadu Research Centre

18 months growth of Ailanthus exceisa in 60 cm^3 pit - Pallakulam Research Centre

The above species were also planted in the periphery of the saucers of 3m dimension at 2 plants / saucer.

Treatments details

Size of pits	Vermicasting	VAM	Azospirillum	Phosphobacteria
$40cm^3$ pit	40gm	20gm	8gm	8gm
$60cm^3$ pit	60gm	25gm	10gm	10gm
$80cm^3$ pit	80gm	30gm	12gm	12gm
$1m^3$ pit	500gm	100gm	30gm	30gm

The species and espacement details are as below

Sl. No.	Location	Species	Treatment
1.	Pallakulam ResearchCentre	*Albizia falcatoria* *Ailanthus malabaricum* *Simaruba glauca* *Ailanthus excelsa* *Populus*	Pit size $40cm^3$, $60cm^3$, $80cm^3$ and $1cm^3$ Espacement 3m x 3m, 5m x 5m
2.	Melakkadu ResearchCentre	*Ailanthus excelsa* *Simaruba glauca* *Bombax ceiba* *Gmelina arborea* *Delonix regia* *Wrightia tinctoria* *Melia dubia* *A. falcatoria*	Pit size $60cm^3$ and $80cm^3$ Espacement 3m x 3m
3.	Arimalam ResearchCentre	*Acacia hybrid* *Albizia richardiana* *Delonix regia* *Simaruba glauca* *Bombax ceiba* *Melia dubia* *Ailanthus excelsa* *Wrightia tinctoria*	Pit size $60cm^3$ and $80cm^3$ Espacement 3m x 3m

Outcome

At the end of two years *Ailanthus excelsa, Simuraba glauca, Bombax ceiba, Wrightia tinctoria* and *Gmelina arborea* are performing better than other species.

4. Establishment of Clonal seed orchard for *Simaruba glauca*

Simaruba glauca, the paradise tree has gained impetus recently due to its high oil yield and other medicinal uses. The research wing has assembled the germplasm for the species in many centres over the years. From among these assemblage, plus trees were identified based on seed yield and clones were produced from these high yielders. These clones were used to raise clonal seed orchard at Pallakulam research centre, Industrial Wood Research Division, Trichy.

Outcome

During the second year It was observed that the vegetative growth of GKVK 28 is better than the other two clones.

5. Progeny evaluation of *Alnus napalensis* and *Acacia mearnsii*

Alnus napalensis wood was tested for its suitability for Match wood industry and it was found that it is highly suitable for Match wood. Seeds of *Alnus nepalensis* and *Acacia mearnsii* plus trees (40% tannin content) were collected from Candidate Plus Trees after extensive genetic combing in plantations of Kodaikanal and raised to evaluate growth performance of seedlings at Pambapuram in Kodaikanal research centre, Industrial Wood Research Division, Trichy. Alnus species and wattle species were planted in 1m^3 and 60cm^3 pits with application of bio fertilizers, to assess the growth rate.

Treatments

Bio fertilizers	1m^3	60cm^3
Vermicasting	1500g	400g
VAM	100g	60g
Azospirillum	50g	50g
Phosphobacteria	50g	50g

Performance at the end of 18th month

Species	Survival %	Av. Height
A. nepalensis	33.75	0.65cm
A. mearnsii	62.5	1.54cm

Outcome:

At the end of 18th month it was observed both the species are performed well.

6. Genetic Combing

Genetic combing for superior trees having fast growth, straight cylindrical bole, narrow crown, high wood density, resistant to pest and diseases and self pruning were carried out and plus trees selected for the following species.

Species Name

1	*Terminalia chebula*	11	*Adina cardifolia*
2	*Azadirachta indica*	12.	*Emblica officinalis*

3	*Pongamia pinnata*	13.	*Hardwickia binnata*
4	*Sapindus emerginatus*	14.	*Dalbergia latifolia*
5	*Ailanthus excelsa*	15.	*Bassia latifolia*
6	*Albizzia lebbeck*	16.	*Gmelina arborea*
7	*Tamarindus indica*	17.	*Melia dubia*
8	*Chloroxylon swietenia*	18.	*Pterocarpus marsupium*
9	*Syzygium cumini*	19.	*Tectona grandis*
10	*Aegle marmelos*	20.	*Pterocarpus santalinus*

Boswelia serrata

Shorea talura CPT

Albizia lebbeck CPT

Separate CPT direct ory and Germplasm bank directory are already maintained for species like Teak, Nelli, Tamarind, *Terminalia chebula, Acacia mangium, Dalbergia latifolia, Sapindus emarginattus, Eucalyptus tereticornis* etc. to monitor the identified CPT's in each division. Similarly, hedge stools are also maintained for all the identified, selected plus trees. Genetic combing will be continued for more species in the next year also.

During 2004-05 CPTs were identified for the following species

Sl. No.	Name of Species	Sl. No.	Name of Species
1.	*Shorea talura*	13.	*Cassia fistula*
2.	*Bosewellia serrata*	14.	*Sterculia urens*
3.	*Strychnos potatorum*	15.	*Kattu murungai*
4.	*Strychnos nuxvomica*	16.	*Laurapita guainensis*
5.	*Bridelia retusa*	17.	*Crateva religiosa*
6.	*Dalbergia latifolia*	18.	*Calotropis procera*

Sl. No.	Name of Species	Sl. No.	Name of Species
7.	*Terminalia bellarica*	19.	*Sapindus laurifolius*
8.	*Sapindus emarginatus*	20.	*Dalbenia Montana*
9.	*Aegle marmelos*	21.	*Persea macranta*
10.	*Pithecellobium dulce*	22.	*Hydnocarpus pentandra*
11.	*Zizyphus jujube*	23.	*Syzygium cuminii*
12.	*Terminalia cattappa*	24.	*Grewia tiliafolia*

7. Assemblage of Bamboo Species

India is rich in Bamboos, particularly North east and Western Ghats are known for many varieties of Bamboos.

The Bamboo Research was started in the early 1990s with an assemblage of available Bamboo species in different research centers. The assemblage was initiated during 1995-96 a Valavayal followed by the assemblage at Erumadu, Coimbatore, Bhavanisagar and Amaravathy during 1997-98. The initial effort was to see that all the bamboos are surviving under different climatic conditions. Then it was decided to gradually develop clonal multiplication technology since the Bamboo seeding takes place at a longer interval of 30 - 40 years. The efforts were not successful at Valavayal and Erumadu and Coimbatore. However, the Bamboo setum established at Amaravathy performed well. Almost all the varieties introduced are surviving as on today. It has become a well known center for Bamboo Research.

Bamboo plants from K.F.R.I, TPGRI, FRI, and available with other state forest departments were produced and assembled. Till March 2001, only 9 varieties of Bamboos were assembled. Every year efforts were taken to increase the number of species. As on March 31st, 2005, 41 varieties of Bamboos are available in the Bamboo setum.

Wherever there is sufficient base population for multiplication, efforts are being made to develop Clonal multiplication technology. In the last few years, about 50000 bamboo clonal plants have been produced and distributed to forest department, other research divisions, TAFCORN and farmers. Further efforts were being made to develop clonal multiplication technology for selected bamboo varieties under different research write ups. The following are some of the species which have been mass multiplied in the recent past.

1) *Bambusa vulgaris*
2) *Bambusa striata*
3) *Bambusa balcooa*
4) *Gaduva angustifolia*
5) *Bambusa nutans*
6) *Bambusa tulda*
7) *Dendrocalamus longispathus*
8) *Bambusa membranaceous*
9) *Dendrocalamus calostachys*
10) *Dendrocalamus giganticus*

LIST OF BAMBOO SPECIES ASSEMBLED SO FAR :

Sl. No.	Species Name	Centres			
		Amaravathy	Coimbatore	Vilamundy & Bhavanisagar	Erumadu
1.	*Bambusa arundinaria*	✓			
2.	*Bambusa balcooa*	✓	✓	✓	
3.	*Bambusa bamboo*	✓	✓		
4.	*Bambusa burmanica*	✓	✓		
5.	*Bambusa giganteus*	✓	✓		
6.	*Bambusa membraneaceus*	✓	✓	✓	
7.	*Bambusa multiplex or Bambusa nana*	✓	✓		
8.	*Bambusa nutans*	✓	✓	✓	
9.	*Bambusa polymorpha*	✓	✓	✓	
10.	*Bambusa tulda*	✓	✓	✓	
11.	*Bambusa striata*	✓	✓	✓	
12.	*Bambusa vulgaris*	✓	✓	✓	
13.	*Bamboosa varigata*	✓	✓		
14.	*Bambusa wamin*	✓	✓		
15.	*Cephalostahyum pergracile*	✓	✓		
16.	*Dendrocalamus asper*	✓			
17.	*Dendrocalamus brandisii*	✓			
18.	*Dendrocalamus calostachys*	✓	✓	✓	
19.	*Dendrocalamus giganteus*	✓	✓	✓	
20.	*Dendrocalamus hamiltonii*	✓	✓		
21.	*Dendrocalamus longispathus*	✓	✓		
22.	*Dendrocalamus longispiculata*	✓			
23.	*Dendrocalamus membranecaceus*	✓			
24.	*Dendrocalamus sikkimensis*	✓			
25.	*Dendrocalamus strictus*		✓		
26.	*Dinochloa andamanicus*	✓			
27.	*Gigantichloa nigrociliata*	✓			
28.	*Gudua angustifolia*	✓	✓	✓	
29.	*Melocanna baccifera*	✓		✓	
30.	*Ochlandra ebrateata*	✓			
31.	*Ochlandra wightii*	✓			
32.	*Ochlandra scriptoria*	✓			
33.	*Ochlandra travencorica*	✓			
34.	*Oxytenanthera nigrociliata (or) Gigantocloa manggong*	✓			
35.	*Pseudo oxytenanthra stocksii*	✓			

36.	*Pseudo oxytenanthra ritchii*	✓			
37.	*Thrystostachys simensis*	✓			
38.	*Thrystostachys oliverii*	✓			
39.	*Bamboo species (not yet identified)*				
40.	*Arunadinaria species*		✓		
41.	*Bambusa nigra (Black Bamboo)*				

Bambusa Dolvmordha

Bambusa gigantea

Giganticlova nigrociliata

Ochlandra travancorica

Trytostackys oliverii

III. RESEARCH ON SOIL NUTRIENT MANAGEMENT

1) Study on Effect of Magnesium sulphate sludge on growth and development of important tree species

Magnesium sulphate sludge is a waste product obtained from magnesium sulphate manufacturing industry. It contains about one milligram of magnesium sulphate per kg of waste. To study the impact of magnesium sulphate sludge and to utilize the waste effectively the sludge was applied to the following species both in nursery and out planting at State Forest Research Institute, Kolapakkam during 2004-05.

Species

Acacia auriculiformis

Simaruba glauca

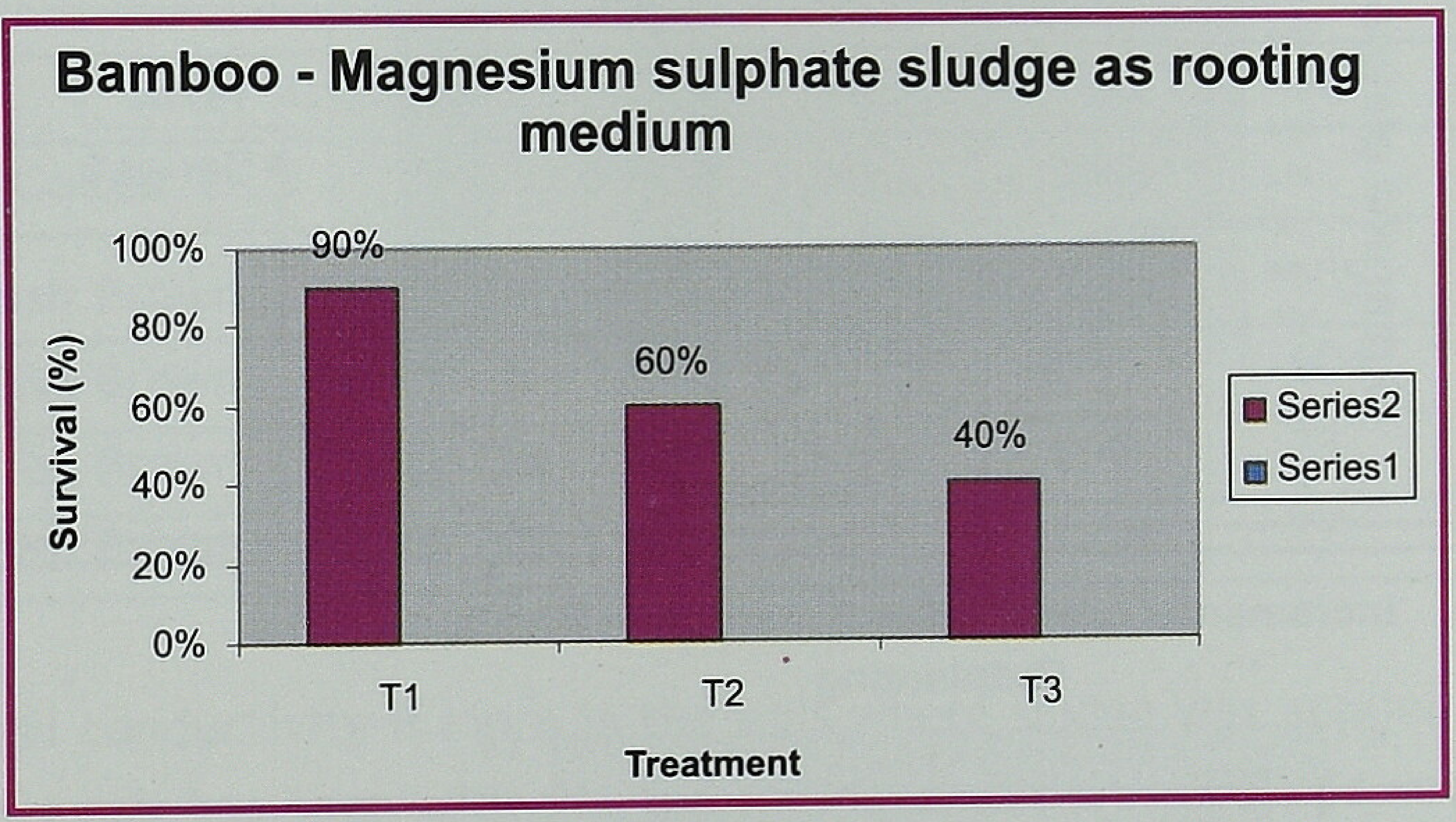
Bambusa mukalba

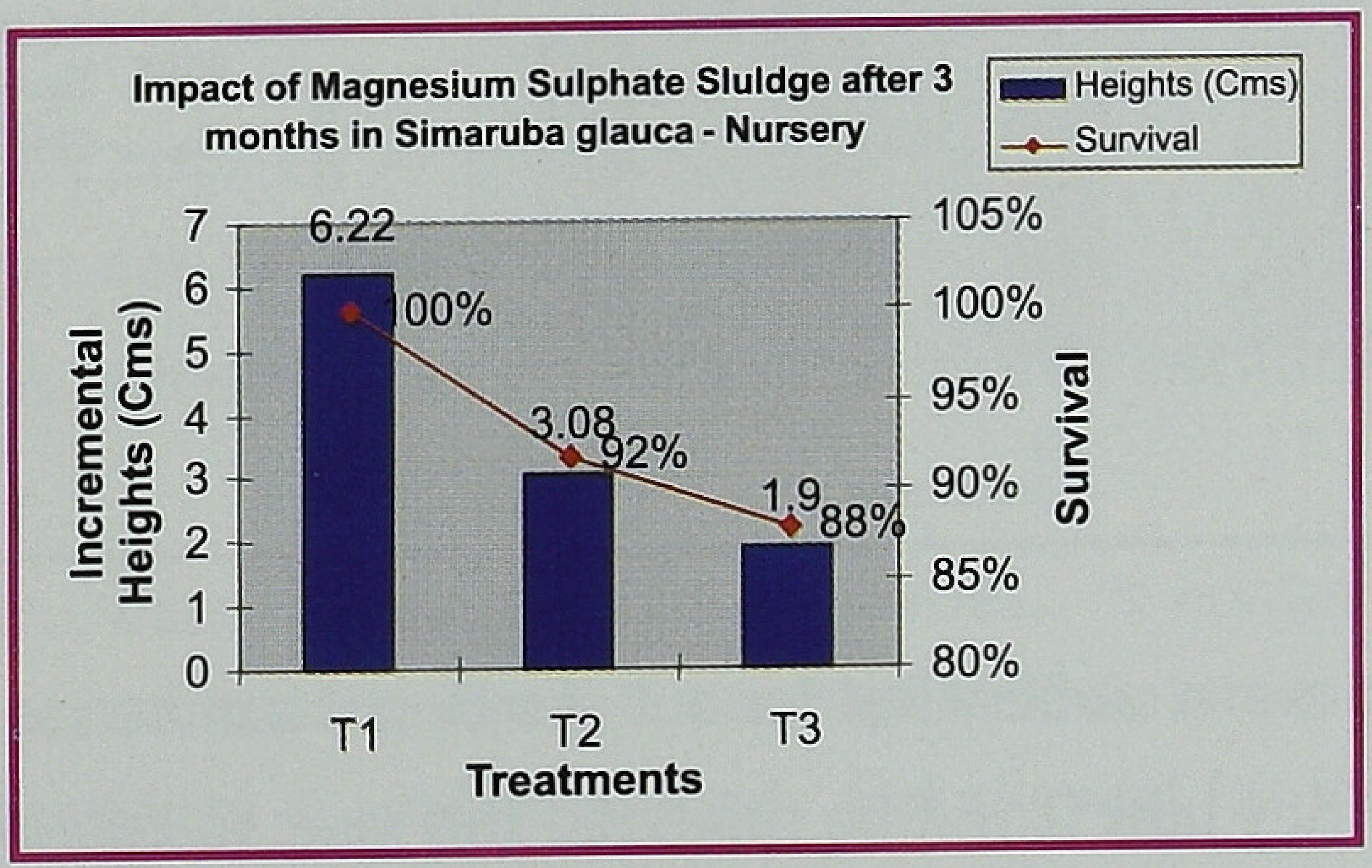
a) Nursery

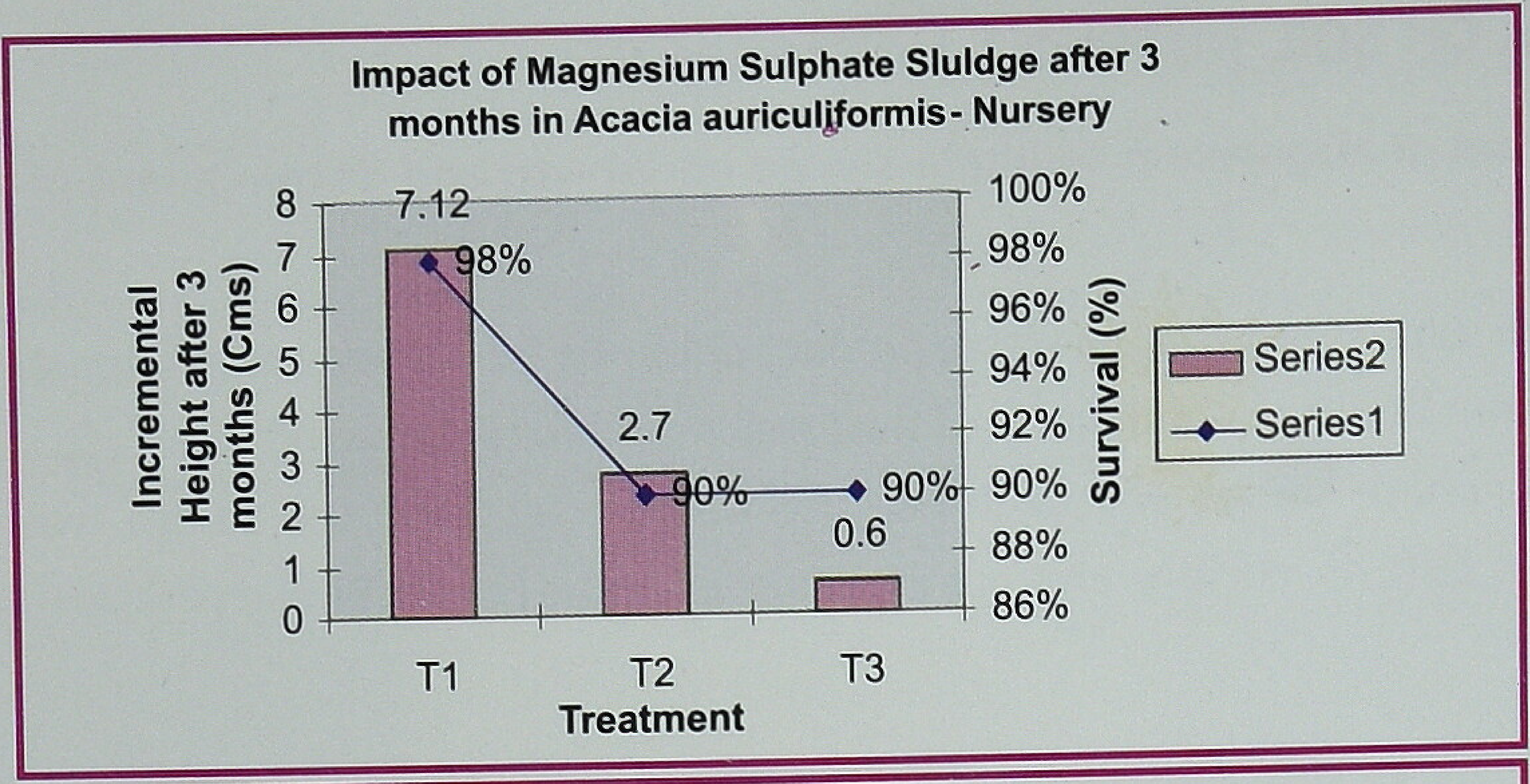
In 13 x 25cm polythene bags containing the above species, following treatments were imposed.

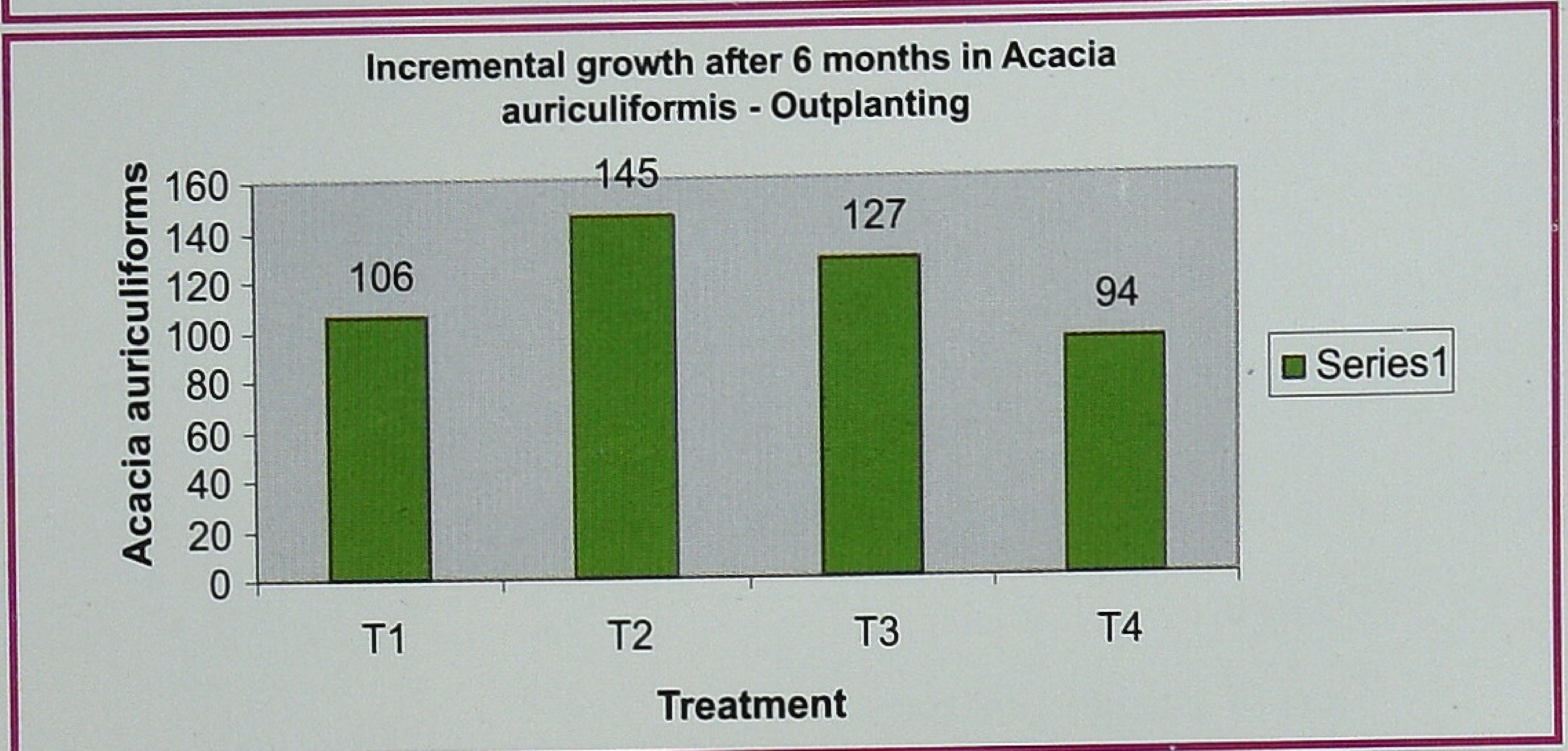
T1	-	Control
T2	-	5gm of sludge per bag
T3	-	10gm of sludge per bag

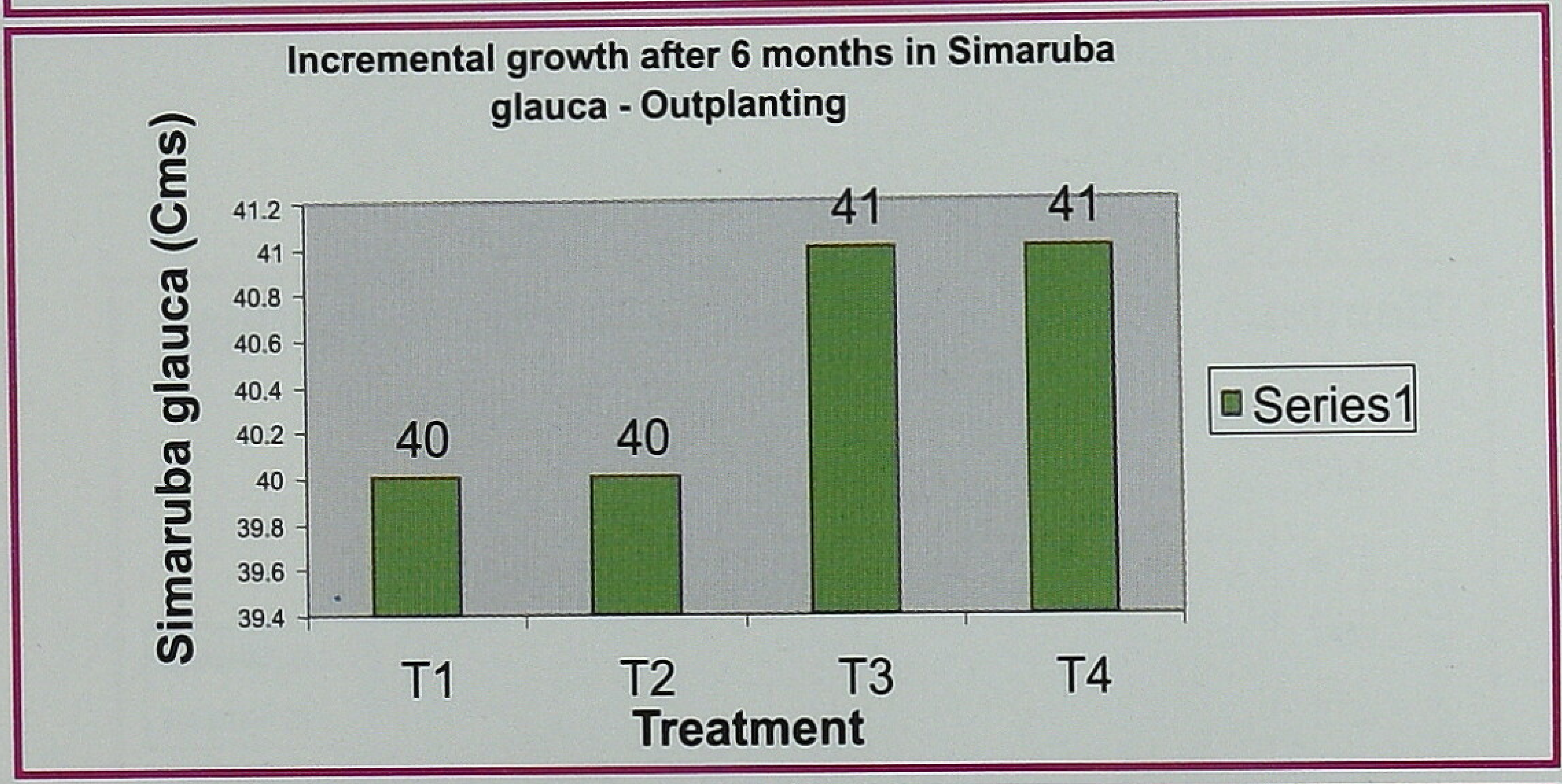
b) Out planting : Av height (Cm)(Incremental)

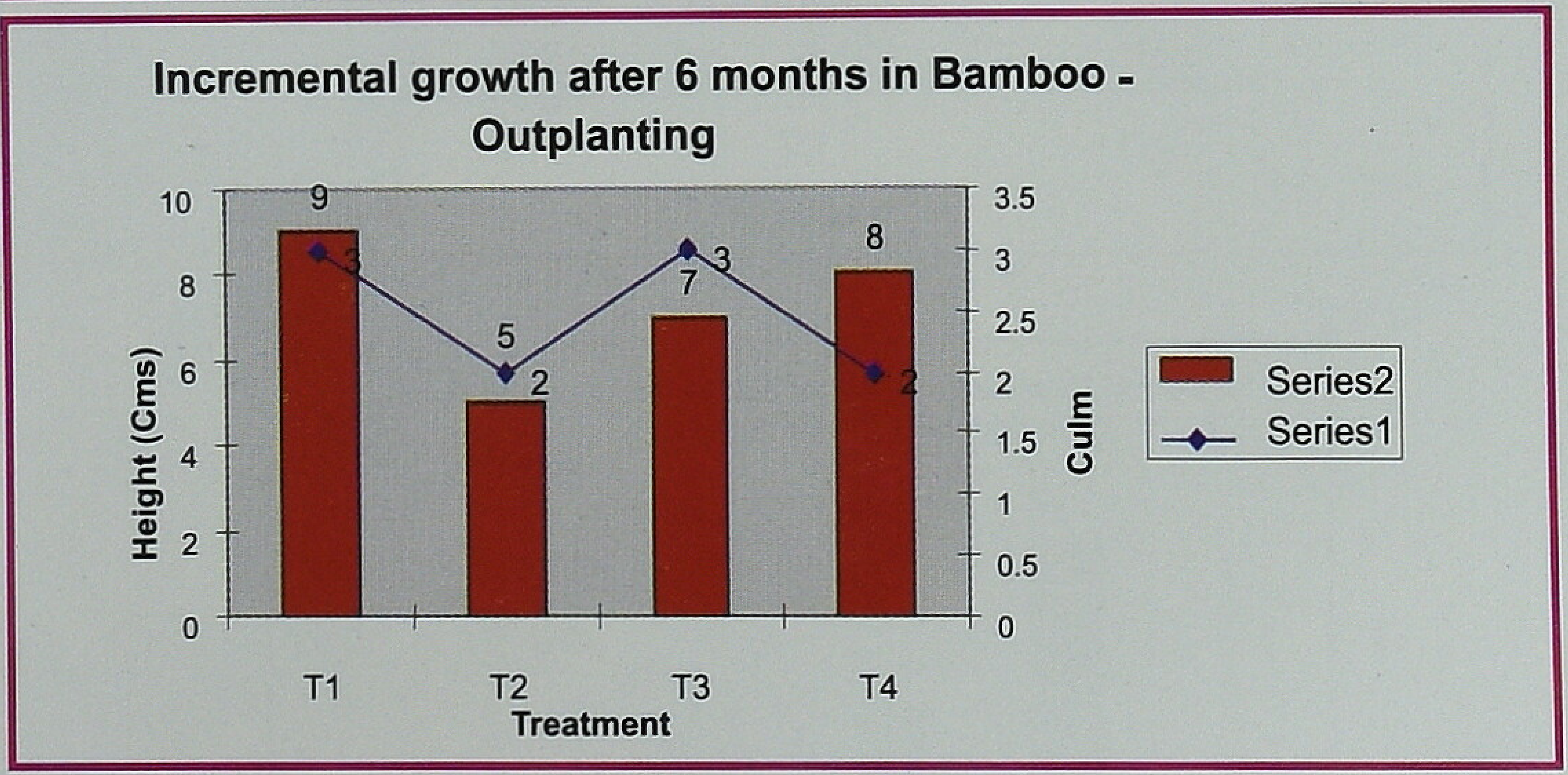












Outcome

It is not advisable to use in nursery but for out planting it can be used for fast growing species like *Acacia auriculiformis*. Any how it will be repeated this year to confirm the results.

2. Study on effect of Magnesium sulphate on natural forest cover

To study the effect of magnesium sulphate sludge on the natural forest bushes of uniform size near State Forest Research Institute and having representative population of 3m x 3m area was applied with magnesium sulphate in different proportions. The experiment was carried out in State Forest Research Institute during 2004-05.

The prevailing vegetation was, *Atlantia monophylla, Diaspyros feraia, Manilkara hexandra, Zizyphus xyloporus, Butea monosperma, Anacardium occidentale, Ixora pavetta, Pterocarpus marsupiium, Dodonea viscosa, Canthium dicoccum, Odina odoyar, Buchnania texalaris, Flacourtia indica, Carrissa carandus, Cassia auriculiformis* etc.,

Treatments

T_1 Control

T_2 1 kg of sludge / m^2

T_3 3 kg of sludge / m^2

T_4 5 kg of sludge / m^2

Soil test result

Before Application				EC	N	P	K
Treatment	Colour	Texture	pH	dsm^{-1}	Kg/acre		
T_1	Brown	Sandy Clay loam	5.9	0.05	143	2.5	75
T_2	Brown	Sandy Clay loam	5.8	0.04	128	2.5	110
T_3	Brown	Sandy Clay loam	5.8	0.04	154	2.5	95
T_4	Brown	Sandy Clay loam	5.5	0.08	172	2.5	110

After Application				EC	N	P	K
Treatment	Colour	Texture	pH	dsm^{-1}	Kg/acre		
T_1	Redish Brown	Sandy Clay loam	5.4	0.10	105	14.3	57
T_2	Redish Brown	Sandy Clay loam	5.7	0.17	104	7.35	60
T_3	Redish Brown	Sandy Clay loam	5.6	1.45	73	0.025	102
T_4	Redish Brown	Sandy Clay loam	5.5	2.06	77	16.5	30

Outcome

The electrical conductivity is more in the soils where sludge was applied. This shows that magnesium sulphate salt has been added to the soil. Much difference could not be seen in other parameters. The soil characterization such as Texture, E.CL pH remained the same. The soil available 'P' has increased.

3. Effect of spent wash on natural forest cover

The experiment was carried out in State Forest Research Institute during 2004-05. This is a ten year experiment.

Spent wash is waste water obtained from distilleries. It contains plant nutrients but it is loaded with organic and inorganic salts. The E.C is as high as 38.0, but in contains traces of nutrients. It can be used as soil amendment if applied properly and allowed for frequent leaching.

Therefore, an attempt was made to study the effect of spent wash on natural forest cover. The prevailing vegetation was, *Atlantia monophylla, Diaspyros feraia, Manilkara hexandra, Zizyphus xyloporus, Butea monosperma, Anacardium occidentale, Exora pavetta, Pterocarpus marsupiium, Dodonea viscosa, Canthium dicoccum, Odina odoyar, Buchnania texalaris, Flacourtia indica, Carrissa carandus, Cassia auriculiformis* etc.,

Treatments and observations

Before treatment

Treatments	colour	Texture	pH	E.C	N	P	K
				dsm^{-1}	Kg/acre		
T_1 Control	Brown	Sandy Loam	5.4	0.01	148	3.0	114
T_2 10 Lit / M^2	Brown	Sandy Loam	5.8	0.07	144	2.5	110
T_3 20 Lit / M^2	Brown	Sandy Loam	5.1	0.86	158	3.0	114

After treatment

Treatments	colour	Texture	pH	E.C	N	P	K
				dsm^{-1}	Kg/acre		
T_1 Control	Reddish Brown	Sandy Loam	5.6	0.09	44	12.6	15
T_2 10 Lit / M^2	Reddish Brown	Sandy Loam	5.6	0.66	45.6	10.95	15
T_3 20 Lit / M^2	Reddish Brown	Sandy Loam	5.5	0.86	65	0.4	18

Outcome

It was observed that, *Exora pavetta* species died off in 15 days after application of spent wash at both i.e. T_2 and T_3 the species in untreated plot was alive, shows the detrimental effects of spent wash on *Exora pavetta*. The soil characterization such as Texture, E.CL pH remained the same. The soil available 'P' has increased.

4. Study on effect of Integrated Nutrient Management on *Bassia latifolia, Jatropha curcus, Derris indica*.

To standardize nutrient management practices, different doses of different Bio-fertilizers and inorganic fertilizers were applied and the effect on performance is being studied. The experiment was conducted at State Forestry Research Institute, during 2004-05.

	Treatments (per plant)	Cost
T_1	Control	Nil
T_2	20 g N + 30 g P + 10 g K	0.4 NP
T_3	80 g N + 120 g P + 40 g K	1.6 NP
T_4	T2 + Bio-fertilizer (20 g VAM + 20 gm Azosprilium + 20 gm Phosphobacteria)	1.5
T_5	Poultry Manure 500 gm + Bio-fertilizers	2.4
T_6	VC 500 gm + Bio-fertilizer	3.4
T_7	Bio-fertilizer + Poultry Manure 500 g + VC 500 g	4.9
T_8	VC 500 g	2.5
T_9	Poultry Manure 500g	1.5

INM for Jatropha curcus

INM for Derris indica

Outcome

Three month since passed application and planting. Any results could be concluded on the next year.

5. Studying on evaluation of organic mulching in *Simaruba glauca*

The experiment was conducted at State Forestry Research Institute, during 2004-05.

Mulching material spread over the soil for improving soil tilth, moisture holding capacity, conserves top soil from erosion, prevent run off, control seed growth and prolong water regime.

An attempt was made to identify cost effective, suitable mulch material for *Simaruba glauca*

Mulch materials like saw dust, Casuarina needles, wood shavings, polymer, paddy chaff, etc., were applied to 3-4 inches thick.

Soil samples were collected at 60cm depth, before and after mulching and soil moisture % was tested and compared.

T_1	Control
T_2	Saw dust
T_3	Straw-Paddy
T_4	Casuarina needles
T_5	Half decomposed leaves *Acacia auriculiforms*, Cashew etc
T_6	Wood shavings
T_7	Polymer
T_8	Paddy chaff

Soil test results and plant height before and 3 months after treatment

Wood shavings

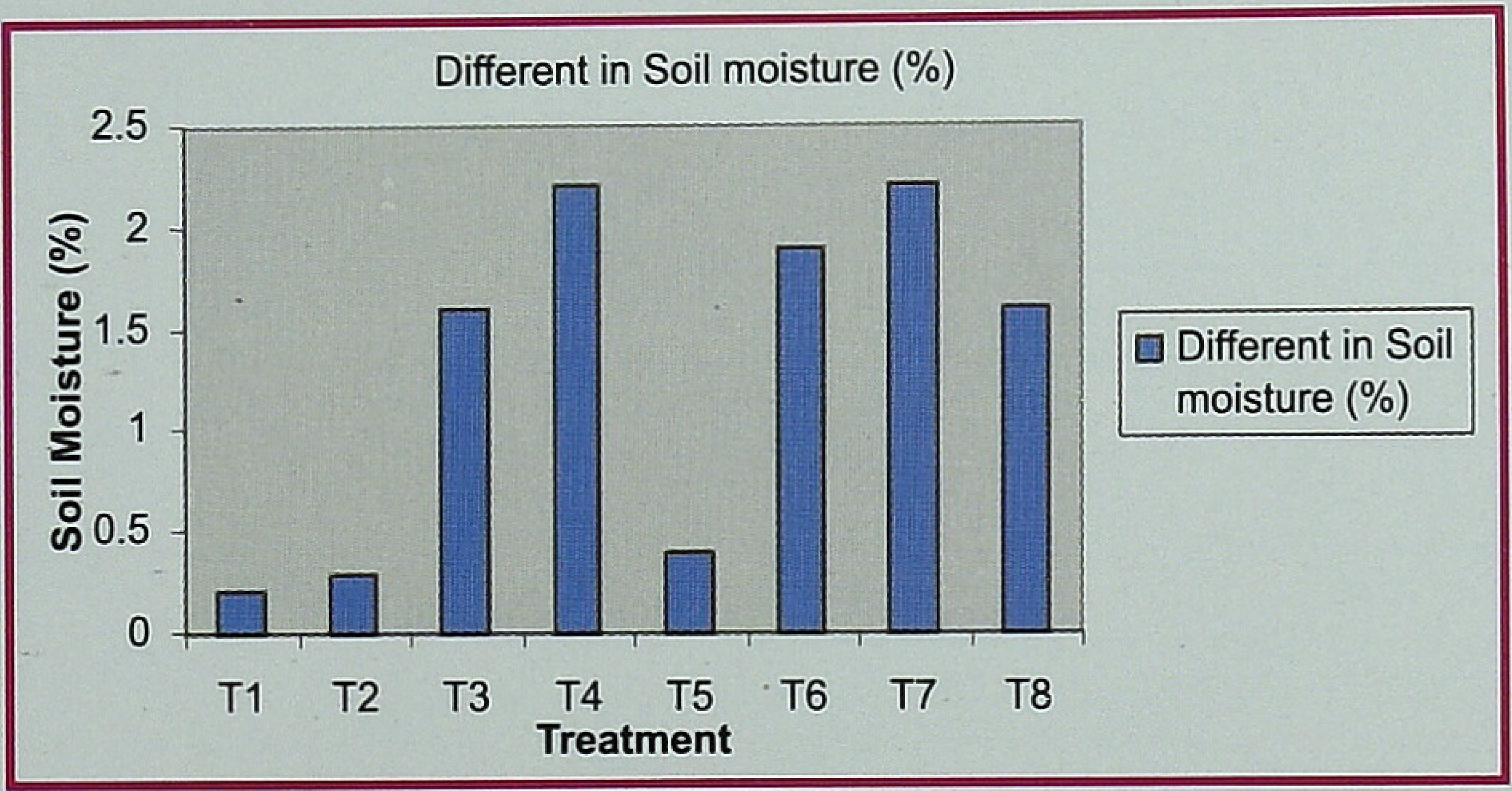
Paddy chaff

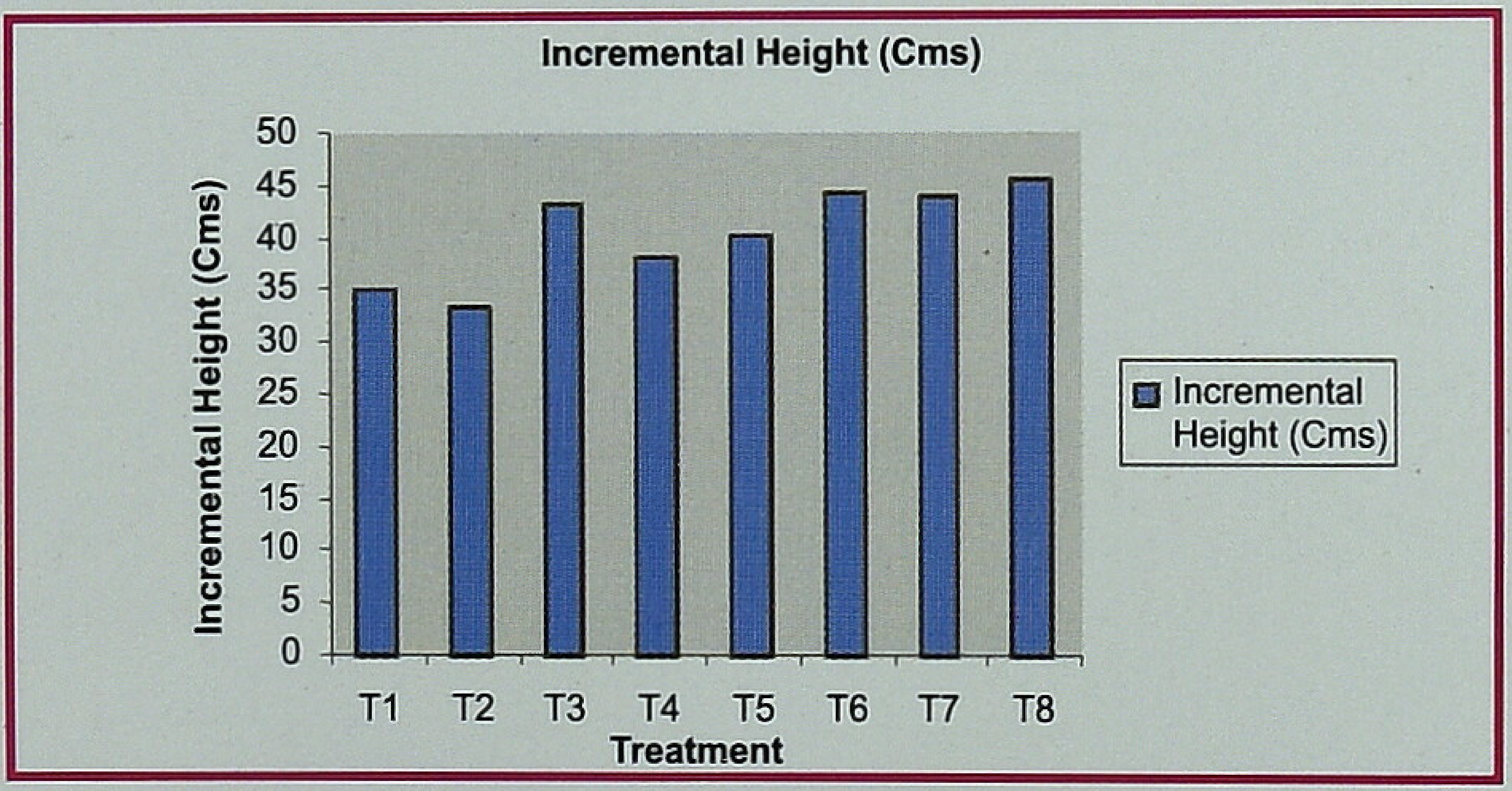
Saw dust

Polymer

Leaf litter

Paddy straw





Outcome

It was evident from the table that the treatments T_3, T_4, T_6, T_7 and T_8 have out performed others. Based on the availability of the material and cost, any one of the above mulch material can be applied. Leaf litter and Causuarina needles can be colleted in the farm and can be applied. Cost of the mulch materials varies from place to place, but all the mulch materials are effective.

IV. AFFORESTATION RESEARCH

1. Artificial Regeneration of Mangrove species

The Mangrove forests are dwindling day by day all over India. Hence the experiment was conducted to prevent soil erosion by re-clothing vacant places with mangrove species and to evolve suitable techniques required for artificial regeneration of the species, to study the mangrove succession models and for the restoration of flora of mangrove ecosystem, some of the mangrove species were planted in an espacement of 4mx4m in $30m^3$ in an area of 1 ha at Killai R.F, State Forest Research Institute during 2004-05.

Treatment

T1-Control
T2-Spent wash 50ml per plant
T3-Spent wash 1litre per plant
T4-Gypsum as per recommendation
T5-Farm Yard Manure 2Kg per plant

Bio fertilizer doses

Vermicasting-500g per pit

List of Species planted :

Sl. No.	Species	Sl. No.	Species
	Trees		
1.	*Rhizophora apiculata*	11.	*Tephrosia purpurea*
2.	*Rhizophora mucronata*	12.	*Acanthus illicifolius*
3.	*Bruguira cylindrical*		Climbers
4.	*Avicennia marina*	13.	*Clerodendrum inermi*
5.	*Avicennia officinalis*	14.	*Abrus precatorius*
6.	*Excoecaria agallocha*	15.	*Vernomia cinera*
7.	*Aegiceras corniculatum*		
8.	*Salvadora Persica*		Herbs
	Shrubs	16.	*Asperagus racemosus*
9.	*Suaeda maritime*	17.	*Solanum trilobatum*
10.	*Croteraria laburaifolia*	18.	*Cyperus arenaries*

Outcome

Growth rate is under observation.

2. Improving Tank Bed Afforestation planting technique

Tank bed soils are either alkaline soil or saline soil. Usually Tank beds are afforested with thorny species like *Acacia nilotica*. Hence tank beds were afforested with some other species as listed below by applying gypsum, spent wash and bio-fertilizers. The species selected are the species

of multipurpose utility and also chosen by Comprehensive Wasteland Development Programme at Mavilikulam Tank bed in Pudukottai District, Modern Nursery Division during 2004-05.

List of Species

1. *Thespesia populnea*
2. *Acacia leucophloea*
3. *Ailanthus excelsa*
4. *Acacia nilotica*
5. *Bambusa valgaris*
6. *Bassia latifolia*
7. *Dalbergia sissoo*
8. *Melia dubia*
9. *Swietenia mahagony*
10. *Emblica officinalis*
11. *Bombusa aurundinace*
12. *Terminalia bellerica*

The details of survival is as follows

Species	Survival	Survival Percentage
Thespesia populnea	282	87.04
Acacia leucophloea	198	61.11
Ailanthus excelsa	240	74.07
Acacia nilotica	309	95.37
Bambusa valgaris	130	40.12
Bassia latifolia	213	65.74
Dalbergia sissoo	246	75.93
Melia dubia	143	44.14
Swietenia mahagony	74	22.84
Emblica officinalis	242	74.69
Bombusa aurundinace	221	68.21
Terminalia bellerica	102	31.48
Total	**2400**	**61.72**

B) ONGOING AFFORESTATION RESEARCH

1. Reclamation and Reforestation of Sand dune Theri

Management of sand dunes by planting with big plants is a widely followed practice. At pattakkarai Research centre which is a sand dune area in the past reclamation efforts were made by planting with Palmyrah, *Acacia planiforns, Albizia lebbeck, Azadirachta indica* and *Dodonea viscosa*. Later on *Acacia senegal, Prosobis juliflora, Acacia mangium, Albizia procera, Salvidora persica,*

Acacia leucopholea, Acacia mearnsii were tried but in vain. Hence, an experiment was taken up to afforest this theri area by using convergent technologies. Propagules from Pheno-typically superior plus trees of *Tecomella undulata, Kaya senegalensis, Azadirachta indica, Albizia lebbeck* and *Albizia richardiana* were obtained and planted in 60cm3 pits.

The treatment details are as follows

T1	-	Control
T2	-	Application of 2kg Tank silt
T3	-	Application of bio fertilizer and bio nutrient
T4	-	T2 + T3

Bio fertilizer details

Size of pits	Vermicasting	VAM	Azospirillum	Phosphobacteria
60cm3 pit	60gm	25gm	10gm	10gm

18 months Appreciable growth of Acacia hybrid in Theri Pattakarai Research Centre

Growth performance of ranking at the end of 17th month

Species	Treatment
1. *S. glauca*	I Rank - T3 with saucer II Rank - T4 with saucer
2. *H. tiliaceus*	I Rank - T5 with saucer II Rank - T3 with saucer
3. *A. hybrid*	I Rank - T2 with saucer II Rank - T3 with saucer
4. *A. lebbeck*	I Rank - T3 without saucer II Rank - T4 without saucer
5. *A. indica*	I Rank - T5 with saucer II Rank - T4 with saucer
6. *A. richardiana*	I Rank - T4 with saucer II Rank - T5 with saucer

V. AGRO FORESTRY RESEARCH

1. Introduction of canes under *Kaya senegalensis* and Medicinal plants

Canes were introduced already in three year old established *Kaya senegalensis* plantation. This experiment was conducted at Gopachandram research centre by Industrial Wood Division, Trichy. The objective of this trial was to assess the performance of Canes under *Kaya senegalensis* and to study possibilities of intercropping in *Kaya senegalensis* for economic gain.

The intercropping was at three levels

Top storey	:	*Kaya senegalensis*
Middle Storey	:	*Calamus rotang,*
		C. brandisii,
		C. hookeriana,
		C. thwartesii,
		C.vattiyala
Lowest storey	:	*Phyllanthus amaranthus*
		Withania somnifera
		Alpinia galanga
		Aloe vera
		Acrous calamus.
Method of Planting	:	Quincunx method in 45cm3 pits.

Performance at the end of 17th month

Species	Survival %
C. rotang	80
C. brandisii	75
C. hookerianus	90

Outcome

Most of the cane species planted have established well.

VI. BIODIVERSITY CONSERVATION RESEARCH

1. Species Recovery programme for critically endangered species - *Hildigardia populifolia*

Hildigardia populifolia locally once known as Malaipuvarasu is a red listed species threatened and endemic of Eastern Ghats. To preserve the rare habitat from further biotic pressure and to prevent genetic erosion of this species, from 13 trees located in Kalrayans, clonal materials were collected and 100 plants were raised. An hedge tool was formed at Bhavanisagar research centre, Genetics division, Coimbatore during 2004-05 in an espacement of 1m x 1m.

2. Species Recovery programme for critically endangered species - *Celastrus paniculatus*

Celastrus peniculatus is a red listed species and the clonal propagation is being standardized in genetics division for past two years and the success rate was found to be 25%. This is an important medicinal plant and proper multiplication technology and adequate base population is required. Therefore about 160 seedlings have been clonally multiplied and kept ready for planting during next year at Sadivayal.

3. Species Recovery programme for critically endangered species - *Podocarpus wallichiana*

Podocarpus wallichiana is one of the three gymnosperms in south India. It is endemic to southern parts of western ghats and also one of the critically endangered species. Recently the Wildlife Warden, Pollachi has found three trees of this species in a private estate. Therefore a species recovery programme was started and 50 plants are planted in Valparai in Natural habitations during 2004-05. The plants are under observation.

4. Species Recovery programme for four endangered species of Western Ghats

To identify critically endangered species and to collect propagation material and to standardize basic techniques and experiment was taken up at Topslip, Sarkarpathi, Aliyar and Amaravathi Centres, Genetics division, Coimbatore during 2004-05 for the following species.

Saraca asoka

Semicarpus anacardium

1. *Mimosopsis elengi*
2. *Santalum album*
3. *Celastrus paniculatus*
4. *Saraca asoka*

To introduce the endangered species in its original habitation or in areas were similar conditions were prevailing about 22 Nos. of *Celastrus paniculatus* seedlings were planted at Aliyar - Attakatty main road, *Santalum album* was planted at Attakatty, *Saraca asoka* was planted in Topslip and *Mimosops elengi* was also planted near Topslip in the natural habitation. The plots are under observation.

5. Species Recovery programme for four endangered species in Eastern Ghats

To raise nursery for perfecting the nursery technology and to form an hedge stool with available seedlings for future propagation of this species, an experiment was taken up at Brookhampton, Genetics division, Coimbatore during 2004-05 for the following species.

1. Cottaneaster buxifolius
2. *Mapea foetida*
3. *Michelia nilgirica*

In respect of Cottaneaster buxifolia, clones of this species were collected at 12-15 cm length size having 3-5 nodes and the same were planted in the soil media with root hormones (IBA 5000) inside the mist chamber. Sprouting was noted in the clone after 15 days. Rooting was found after 45-50 days of planting. The success rate of rooting was observed as 80%. The rooted plants were kept in Brookhampton nursery inside the mist chamber and maintained.

Cottoneaster buxifolius Mass multiplication

In respect of *Mapea foetida*, riped seeds were collected and shade dried for 2 days and sown in the raised mother bed with soil and sand media. The germinated seedlings were planted in the soil media inside the mist chamber. Germination started after 25 days from the date of sowing. Maximum seeds germinated in a period of 27 days. The success rate of germination was observed as 78%. The germinated seedlings were transplanted into poly containers filed with soil mixture and maintained in the mist chamber for further period of one month.

Mapea foetida Germplasm assemblage

In respect of *Michelia nilgirica*, riped seeds were collected and shade dried for 2 days and sown in the raised mother bed with soil and sand media and the germinated seedlings were planted in the soil media inside the mist chamber. Germination started after 25 days from the date of sowing. Maximum seeds were germinated in a period of 27 days. The success rate of germination was observed as 78%. The germinated seedlings were transplanted into poly containers filed with soil mixture and maintained in the mist chamber for further period of one month.

b) ONGOING BIO DIVERSITY CONSERVATION RESEARCH

1. Conversion of Monostand into Poly stand with Shola in pine, Wattle & Blue gum plantation

An effort was made by Kodaikanal Research Centre in industrial Wood Research Division research centre to introduce native species in the existing mono stand of Pine, Wattle and Blue gum. The objective of this trial was to restore bio diversity with original vegetation to the extent possible. At Gundar some native species listed below were introduced.

Species

1. *Scolopia crenta,*
2. *Rhododendron nilagiricum,*
3. *Photinia integrifolia,*
4. *Cinnamomum wightii,*
5. *Daphniphyllum neilgherense,*
6. *Pterospermum xylocarpum,*
7. *Symplocos cochinchinensis,*
8. *Eleocarpus recurvatus,*
9. *Elaeocarpus glandulosus.*

Treatments

Pit size	Vermicasting	VAM	Azospirillum	Phosphobacteria
45 cm3	100g	60g	30g	30g

Performance at the end of 17th month F= Failure

Polyculture Species	Qty Planted	Pine Plantation	Wattle Plantation	Bluegum plantation
		Survival(%)	Survival	Survival
G. arborea	18	27	44.44	38.88
A. latifolia	18	F	F	F
M. dubia	18	55	22.22	44.44
S. acrenta	18	27	27.77	F
R. nilagiricum	18	F	F	F
P. integrifolia	18	44	27.77	33.33
C. wightii	18	22	38.88	F
D. neilgherranse	18	27	F	38.88
L. neilgherrense	18	44	38.88	38.88

VII. MEDICINAL PLANTS RESEEARCH

1. Assemblage of Medicinal Plants

A medicinal plant farm has been established at Aliyar over an area of 1 ha. near Forest Check post to serve as a Demonstration plot by assembling all medicinal plants species available in Western Ghats particularly in Indira Gandhi Wildlife Sanctuary to create awareness among the public. Later on the assemblage was converted as germplasm bank and as a base material for multiplication, both seed and clonal means. It is also linking the Topslip MPCA established under FRLHT scheme for all medicinal plants developmental purposes.

A Siddha Doctor is employed on honorarium basis who is visiting twice a week to the centre and explaining things to the visiting public and others. The plants multiplied are being put up for sale on nominal cost basis.

About 50 medicinal plants were introduced and assembled in the centre during 2004-05 and about 500000 medicinal plant seedlings have been produced under different schemes and distributed to other divisions and general public. The following are the few of the important medicinal plants added to Assemblage during 2004-05

1)	*Kemferia galangal*	-	Katcholam
2)	*Hugonia mystax*	-	Kothirakanni
3)	*Crotalaria trifoliastrum*	-	Moovilai chalangai
4)	*Oxalis corniculata*	-	Kodipulichan
5)	*Salacia beddomei*	-	
6)	*Aquillaria agallocha*	-	Atthar
7)	*Couroupita guianensis*	-	Nagalingam
8)	*Lagerstromia flosregina*	-	Mani marudhu
9)	*Averrhoa carambola*	-	Thamartham palam
10)	*Eleaocarpus serratus*	-	Ruthratcham

Though nearly 420 species have been assembled in the centre, till March 2005, many herbs and annuals are repeatedly dying due to their seasonal appearance. The assemblage contains many of the Red listed species which are give priority in all research works. Some of the Red listed species are as follows:

1) *Santalum album*
2) *Rauwolfia serpentina*
3) *Celastrus paniculatus*
4) *Decalepis hamiltonii*
5) *Gymnema sylvestre*

6) *Tinospora cordifolia*

7) *Madhuca longifolia*

8) *Mimosopsis elengi*

9) *Saraca asoka*

10) *Cycas circinalis*

11) *Terminalia arjuna*

12) *Eleocarpus serratus, etc.*

Terminalia ariuna

Gymnema sylvestre-Sirukurinjan

Cinnararia martima

Aerva lanata

Mukia madraspattana

Passiflora eduli

Tinospora cordifolia Nursery Stock

Saraca asoka

2. Studies on Medicinal plants used by Tribals in Nilgiris and Topslip

In Nilgiris and Topslip tribal people are using many wild plants for their own indigenous system of medicine, many of which are reached the 'Red Data Book'. This experiment was conducted at Nilgiris and Topslip, Genetic Division to identify the important medicinal plants and their areas, habitats used for various diseases, to find out the best method of collection, multiplication, to create awareness among farmers to cultivate economically important medicinal plants and Species:

Urginia indica

Milletia splenders

Flemngia walichin

Spermacoce latifolia

Simlax zeylanica

Zingiber roseus

VIII. RESEARCH ON ORGANIC TREE HUSBANDARY

1. Comparing the quality of Vermicasting production with leaves of different species.

Generally vermicasting is produced from press mud, bagasse and farmyard manure in the ratio of 2:1:1. The press mud which is the residue in the manufacture of sugar contains some unfavourable chemicals and to avoid its effect, production of vermicastings by mixing with leaves of different species in different ratio was attempted in Modern nurseries of Harur, Alwarmalai and Perungalathur during 2004-05.

6 Treatments were tried as follows in a tub of 1m x 1m x 1m size. 500 nos. of earthworms were released in each tub.

1) Control = Pressmud 50 Kg. + Bagassee 25 Kg. + Farm yard manure 25 Kg.
2) T_1 = Pressmud 100 Kg. + Leaf litter Nil
3) T_2 = Pressmud 75 Kg. + Leaf litter 25 Kg.
4) T_3 = Pressmud 50 Kg. + Leaf litter 50 Kg.
5) T_4 = Pressmud 25 Kg. + Leaf litter 75 Kg.
6) T_5 = Pressmud Nil + Leaf litter 100 Kg.

The details of Vermicasting collected from various centre is as follows.

Treatment	Collection of Vermicasting (In Kgs.)		
	Harur	Perungalathur	Alwarmalai
T_1	40.700	41.500	42.075
T_2	30.250	29.500	28.900
T_3	22.700	23.450	21.950
T_4	18.950	19.800	20.350
T_5	12.200	13.700	11.575
Control	25.850	24.875	26.450

Outcome

100% Press mud has produced highest yield and 100% leaf litter (T^5) has produced the lowest.

2. Storing of Vermicasting under different temperature and relative humidity condition and analyzing for their quality

This experiment was conducted to find out the suitable covering material for storing Vermicasting without any weight loss at Perungalathur, Modern Nursery Division during 2004-05. There were 6 types of roofing material tried, 27 bags were numbered individually and kept in each roofing. The initial weight of each bag was 35kg. Measurements were recorded for each month, and the average weight after 8th month is as follows

1) Polythene covering - 30.15 Kg.
2) Thatched roofing - 30.10 Kg.
3) Asbestos roofing - 25.76 Kg.

4) Concrete roofing - 26.94 Kg.

5) Zinc sheet roofing - 26.42 Kg.

6) Open air - 31.03 Kg.

Outcome

Weight loss was maximum in asbestos sheet roofing.

3. Finding out optimum requirement of water for vermicasting production

This experiment was conducted at Alwarmalai, Harur, Perungalathur, Modern Nursery division during 2004-05 to find out the optimum requirement of water for the production of vermicasting. Two tubs of size 1.20m x 0.80m x 0.60m (0.5m^3) were selected for this experiment. Raw materials like press mud, beggasse and farmyard manure were filled to a height of 52cm in the ratio of 2:1:1 respectively in the tub. Watering was done to make the raw material conducive for introduction of earthworms and the amount of water added to the tubs each and every time was recorded.

Outcome

It was observed that 0.5m^3 of well decomposed raw material needs 310 ltrs. of water approximately.

4. Effect of different host species on VAM production

To find out the suitable annual host species for the production of VAM and to increase the quality of VAM by increasing the spore count in the VAM, this experiment was conducted at Alwarmalai, Harur, Perungalathur, Modern Nursery Division during 2004-05. The existing VAM bed in the center of size 9.5m x 0.95m x 0.50m were separated into 7 equal partitions of size 33m x 0.95m x 0.5m. Vermiculite 100% were filled in each of the partition. Different host species viz. *Cenchrus ciliaris*, Buffalo grass, Guinea grass, Spear grass, Kambu, Ragi and Maize were sown. The quality of VAM was tested by traphan blue in lacto phenol method (Philips and bayman 1970), and of infection in host plant analysed.

Outcome

The following percentage of fly ash was noticed in various host plants.

Kambu	-	80%
Ragi	-	85%
Cenchrus ciliaris	-	40%
Guinea grass	-	60%
Buffalo grass	-	60%
Spear grass	-	65%
Maize	-	90%

The trial is still under study.

5. Finding out the suitability of Fly ash as a medium for the production of vermicasting

To find out the suitability as a feed for earthworms, Fly ash was brought from the Mettur Thermal power station and mixed among with the following raw materials.

1) Control - Pressmud 150kg. + Beggasse 75kg. + Farm yard manure 75kg.
2) T1 - Fly ash 150kg + Farm yard manure 150 kg
3) T2 - Fly ash 150kg + Pressmud 150kg
4) T3 - Fly ash 100kg + Farm yard manure 100kg, Pressmud 100kg
5) T4 - Fly ash 100kg + Leaves 100kg, Pressmud 100kg.

Vermicasts from each treatment were collected separately and weighed and recorded.

Outcome

Vermicasting production was very poor in all the media containing fly ash, where as the production was 76 Kg in control.

6. Finding out optimum moisture content in vermicasting

In order to find out the requirement of optimum moisture in vermicasts without loosing nutrients, this experiment was conducted at Harur, Modern Nursery Division during 2004-05. Vermicasts were packed in two laminated polypropylene bags which was usually used for storing vermicasts. Weight of each bag after packing is 35kg. The bags were numbered 1 and 2. Water was injected equivalent to the loss of weight in the bag No. 2 and No.1.

Water injections in Bags

Bag No.		14.03.05	14.04.05	14.05.05	18.06.05	14.07.05
1	Weight	35 Kg	34.300 Kg	33.500 Kg	32.500 Kg	32.200 Kg
	Water injected	Nil	Nil	Nil	Nil	Nil
2	Weight	35 Kg	34.200 Kg	33.500 Kg	33.500 Kg	34.000 Kg
	Water injected	Nil	0.820 Lit	1.550 Lit	1.550 Lit	1.030 Lit

Optimum moisture content in vermicasting during storage without nutrient loss

Date of Analysis	Bag 1			Bag 2		
	15.03.2005	21.04.2005	22.6.2005	15.03.2005	21.04.2005	22.6.2005
PH	7.87	6.65	6.55	7.87	6.65	6.69
EC (mmhos/cm)	0.53	3.55	2.96	0.53	3.55	2.20
Organic carbon (%)	22.00	23.00	21.84	22.00	23.00	21.84
Nitrogen (%)	1.10	1.60	1.58	1.10	1.60	1.54
Phosphorus as P2O3 (%)	4.40	6.38	6.10	4.40	6.38	5.06
Potassium as K2O (%)	0.80	0.60	0.27	0.80	0.60	0.25
Calcium (%)	8.90	10.65	7.30	8.90	10.65	6.92
Magnesium (%)	0.71	1.62	0.35	0.74	1.62	0.29
Iron (Mg/Kg)	8600.00	9558.00	15750.00	8600.00	9558.00	13500.00
Zinc (Mg/Kg)	160.00	180.00	167.00	160.00	180.00	142.00
Boron (Mg/Kg)	120.00	80.00	78.00	120.00	80.00	75.00
Manganese (Mg/Kg)	360.00	315.00	395.00	360.00	315.00	337.00
Copper (Mg/Kg)	70.00	83.00	84.00	70.00	83.00	69.00

Outcome

It was found that about 30 % to 50% nutrient was lost during storage after 3 months.

IX POST HARVESTING TECHNOLOGY

The Forest Utilisation Division has with the help of funding by ICFRE set up a post harvest technology centre at Mettupalayam during the year 2000. Here, a solar kiln, for seasoning timber was installed in March 2000 and a chemical pressure treatment plant for giving preservative treatment to timber, bamboo, etc. was installed during September 2000 under ESF, funded by ICFRE. The main idea was to use Eucalyptus and demonstrate to the public the techniques involved for utilizing these species. During the years, 2002-2004, Forest Utilisation Division has installed a Solar seasoning Kiln, Wood working Unit and a Dip Tank for chemical treatment of wood in S.F.R.I, Kolappakam, Chennai. An Interpretation Centre displaying the utility of different tree species in Tamil Nadu, Wood Working Unit and Bamboo Hut with a bamboo Corridor displaying the different Bamboo species in TamilNadu and their uses was done during the current year. To create awareness and popularise utilization of secondary timber species, demonstrations were held continuously at Mettupalayam and at S.F.R.I Chennai besides participating at Trade Fairs, Farmer's Meets, exhibitions in different Districts of TamilNadu, thus reaching out to lakhs of people. During the current year, a Self -Help Group was started in Kolappakam Range for the wood working Unit with Ranger, Kolappakam as the Member Secretary and fifteen members in it including forester, forest watcher and Mali.

The following are the New Projects undertaken during the Year 2004-2005.

1.Studies on utility of various thatching materials

In Sadivayal Tribal Settlement Area, Bolampatti Range,Coimbatore, the Tribals have been constructing traditional Houses with Elephant Grass. In the traditional houses, the Bamboo and elephant grass used are not treated chemically and the longevity is decreased. In the present project the longevity of the traditional Tribal houses are studied both in chemically treated and untreated huts, to evolve the utility and durability of chemically treated thatch and untreated thatch material in housing technology of tribal.

The thatching material used in this study are :

1. *Bambusa bamboo*
2. *Imperata cylindrica - Elephant Grass*

The Elephant grass and Bambusa bamboo were chemically treated in Dip tank with CCA solution (4%) (CCA - Copper Chrome Arsenate solution) for twenty four hours. Later, the thatched huts of

dimensions 10 feet /10 feet were constructed .One thatched hut was treated and another was not treated . These thatched huts were handed over to the tribals.

Tribal Hut (Untreated)

Tribal Hut (Treated)

Result:

The Durability and longevity of the chemically treated thatch and untreated thatch material in housing technology are under observation

2. Utility and durability of juvenile teak

Wood-using industries are compelled to utilize the small teak timber resources for making veneer, joinery, furniture etc. Optimum utilization of the small timber demands are:

1.Improved processing (conversion, preservation and drying) technology

2.Intensive management (Silviculture and genetics) techniques to enhance the log size / quality and reduce the negative effects of juvenile teak wood.

To compare the heartwood and soft wood content, the mechanical properties of juvenile teak and mature teak and the durability of teak furnitures of juvenile and mature teak wood, a study was undertaken.

The wood samples were collected from Tanjavur (Kumbakonam) and Coimbatore Rage of the forest Department. The details are given below both for the irrigated Teak (Juvenile) and Teak are procured from the, Reserve forest (Mature Teak).

The teak for the present study was taken from Bolampatti R.F. of Coimbatore Division of 43 years old (0.743 M^3) and dbh 95 cms. The irrigated teak was taken from Coimbatore which was 10 years old (0.575 $M^{3)\ and}$ dbh 65 cms.

Mature Teak from Tanjavur, Kumbakonam R.F. of Tanjavur Division of 45 years old (.572 M^3)and 85 cms. dbh . The irrigated teak was taken from Kumbakonam 10 years of age(.289 M^3) and dbh of 63 cms. The teak stump was traced on a graph paper and the out line of the area of the heartwood and sapwood was also traced. The area of heartwood and sapwood was determined by taking 1 cm as an unit of measurement on graph. Thus the following ratio was got. Juvenile wood properties are studied as compared to mature wood to assess the utilization potential of short rotation timber.

Results:

a)Heartwood/Sapwood Ratio:

There is difference in the heartwood and sapwood ratio in mature teak and irrigated teak. Heartwood is more in matured teak than in irrigated teak in both areas. The heartwood increases with the increase of age.

Heartwood/Sapwood Ratio

Sl.No.	Place	Heartwood/ Sapwood Ratio
1	Coimbatore RF Teak	1:0.3
2	Coimbatore Irrigated Teak	1:0.9
3	Kumbakonam RF Teak	1:0.2
4	Kumbakonam Irrigated Teak	1:0.7

In the above table, the Heartwood : Sapwood ratio is more in Teak from the Reserve forest (Mature Teak) where as the Heart wood and sapwood ratio less in irrigated Teak.

b) Mechanical properties of mature and Juvenile Teak

Sl.No.	Area	MOEN/mm^2	MORN/mm^2	Sp.gr
1.	Coimbatore (R F)	8230	87.3	0.67
2.	Coimbatore (irrigated)	6279	63.8	0.64
3.	Tanjavur (R F)	7679	86.4	0.69
4.	Tanjavur (irrigated)	6213	61.6	0.65

MOR: Modulus of Rupture: MOE: Modulus of Elasticity

Specific gravity:

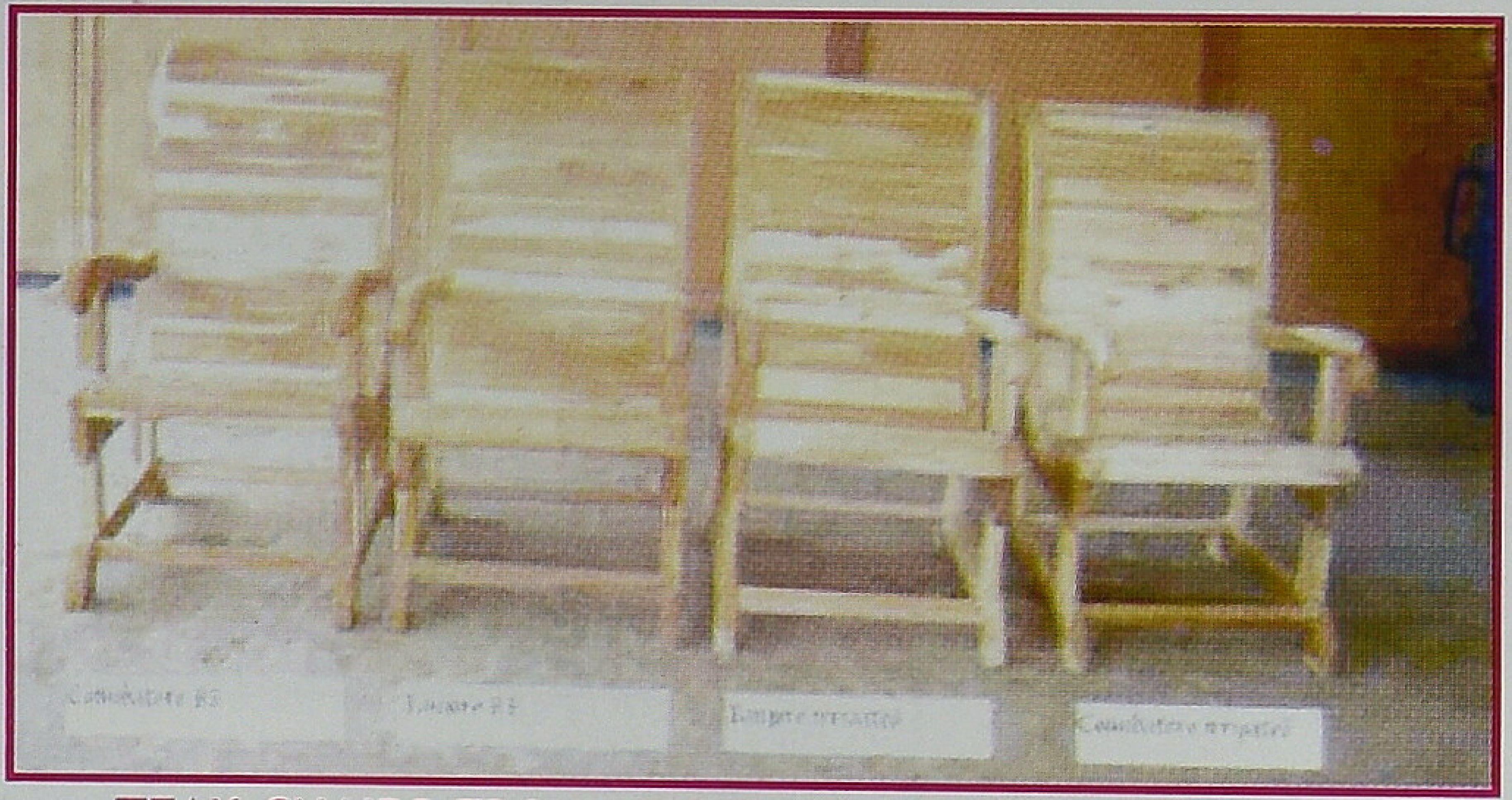
From the above table,it is seen that there is not much difference in the specific gravity of the irrigated teak (Juvenile){ Coimbatore (irrigated)(0.64) and Tanjavur (irrigated)(0.65)}and R F (Teak){ Coimbatore (R F)(0.67) and Tanjavur (R F)(0.69)}.

Modulus of rupture and Modulus of elasticity:

From the above table, it is seen that there is not much difference between the modulus of elasticity and modulus of rupture of both irrigated (Juvenile teak) and R F (Mature) Teak. In the irrigated teak both in Tanjavur and Coimbatore ,the modulus of elasticity and modulus of rupture is less than R F teak both in Tanjavur and Coimbatore.

(c) Fabrication of furniture

A chair was fabricated for both matured and Juvenile teak from both the above mentioned areas and their durability and Study.



TEAK CHAIRS FROM JUVENILE AND MATURED WOOD

1. Coimbatore R.F; **2.** Thanjavur R.F; **3.** Thanjavur irrigated; **4.** Coimbatore Irrigated.

3.Wood for packaging industries - horticultural crops and industrial materials

For Packaging fresh fruits and vegetables is Bags, crates, baskets, cartons, bulk bins, palletized containers are convenient for handling, transporting and marketing fresh produce and industrial material. Packaging and packing materials contribute a significant cost to the produce industry, therefore it is important that the packers, shippers, buyers and consumers have clear understanding of the wide range of packaging options available. Wood is used as a packaging material as it is eco-friendly, bio-degradable and can be reused. Timber is widely used for making packing boxes, cases and crates. The qualities of the timber required are:

1. Light in weight
2. Light in colour or whitish wood
3. Cheap and readily available
4. Straight grained and free from knots, splits and wraps.
5. Resistant to insect attack

The above mentioned qualities are required for packing valuable materials. There are many species used locally as packing materials which do not have all the above mentioned qualities but is preferred as packing materials. Hence to fabricate packaging boxes, crates etc for horticultural crops and industries, to evaluate the durability and longevity of the packaging material and to study the effect of the horticultural crops and industrial material packed with different secondary timber species - Specific studies are required to the conducted.

Different species were sent to different industries and packing units.

1. *Ailanthus excelsa*
2. *Melia dubia*
3. *Grewillea robusta*
4. *Samanea saman*
5. *Ficus religiosa*
6. *Gmelina arborea*

7. *Prunus serisisoides*

8. *Gyrocarpus jacquinii*

9. *Eucalyptus leucodendron*

10. *Eucalyptus tereticornis*

11. *Eucalyptus alba*

12. *Eucalyptus citrodora*

13. *Eucalyptus torelliana*

14. *Acacia auriculiformis*

15. *Eucalyptus commandulensis*

16. *Delonix regia*

17. *Wrightia tinctoria*

18. *Albizia richardiana*

Packing Case Made of Melia dubai

Packing Cases for Vegetables

Outcome:

i. *Melia dubia*: The wood was hard, but suitable for packing cases.

ii. *Samanea saman* : The wood was suitable for all type of packing.

iii. *Ailanthus excelsa* : The wood was not suitable for planks, only used for 4" x 2". 3" 2’and 6" x 4’ reapers.

iv. *Grewillea robusta* : This was the best quality wood suitable for export packing cases and temporary packing cases.

Outcome:

The results on the durability of these species are being recorded time to time.

4. Vegetable dyes from forests

Development of natural dyes has huge economic potential as the demand for these dyes in various industries such as textile, food, pharmaceuticals, and cosmetics has been increasing both at national and international level. Global annual demand of natural dyes is presently estimated to be about 10,000 Tons per annum. Azo’ dyes cause harmful effects during their production and subsequent use. Due to environmental awareness, natural dyes obtained from plants and animals are the dyes of the 21st century (Sources of Natural Dyes in India - K.V.Chandramouli).Trees and plants in the forest areas are a rich source of Natural Dye. All the parts of a tree are tested for the extraction of Natural Dye.

The natural dyes project was done in collaboration with Kalakshetra foundation (Craft Education and Research centre) in Chennai. A forester and Forest guard from FUO unit were trained in vegetable dye painting course (short-term course).

During the year 2003-2004.nearly 20 samples were given to the Kalakshetra where the cloth samples dyed in the vegetable matters i.e. leaves, barks etc of different tree species.

No.	**Name of the species**	Colour
1.	*Chloroxylon swietenia*(bark)	Dark Brownish green
2.	*Albizia lebbek* (bark)	
3.	*Delonix elata* (bark)	
4.	*Acacia mangium* (bark)	
5.	*Acacia auriculiformis* (bark)	Brownish green
6.	*Simaruba glauca* (leaves)	
7.	*Dalbergia sisso* (leaves)	
8.	*Anacardium occidentale* (leaves)	
9.	*Wrightia tinctoria* (leaves)	Light Brownish green
10.	*Thespesia populenea* (leaves)	
11.	*Acacia catechu* (leaves)	
12.	*Delonix elata* (leaves)	
13.	*Acacia auriculiformis* (leaves)	
14.	*Pithecelobium dulce* (leaves)	
15.	*Adina cordifolia* (bark)	Light Brownish pink
16.	*Chloroxylon swietenia* (bark)	Dark Brownish pink
17.	*Casuarina equisetifolia*	Light green with greyish tinge
18.	*Pterocarpus marsupium* (bark)	Light Brownish pink
19.	*Pterocarpus santalinus* (bark)	Light Reddish pink
20.	*Ailanthus excelsa* (leaves)	Light green

Such forest species grown for dye purpose can be grown with other agricultural crops, on bunds, in multi-storey agro forestry systems in farmers land etc. This experiment was undertaken for utilizing various parts of the trees in Reserve forest and agro-forestry tree species as natural dyes and check its efficiency as a dye on colour fastness to light and washing. Nearly 50 samples were given to Kalakshetra ,where the cloth samples dyed in the vegetable matters i.e. leaves, barks etc. of different tree species.

For all the 50 tree species, the leaves, bark and flowers(for some) were collected and dried well. Later, powdered in a pulveriser and 500 grams were given to Kalakshetra Institute,Chennai, for using as a natural dye on fabric. After the dyed fabric is got, dyed fabric was rested for fastness to washing and fastness to light.

Fastness tests on dyed and printed materials:

Coloured materials are tested for fastness to a number of agencies like Washing, Rubbing, Light etc. Each one acts in a different way, one being independent of the other.

The dyes were numbered from 1 to 5; 1 being the slowest and 5 the fastest. This system which is in use all over the world is preferred as it can be expanded to include faster dyes (faster than 5) without disorganizing the system. The fastness to light of dye stuffs is expressed numerically from 1 to 8 instead of from 1 to 5 to enable the very fast to light (having fastness to light from 5 to 8) to be differentiated; number 1 indicates very poor fastness to light and number 8 outstanding fastness to light. In the case of light fastness, depth of shade is particularly important since most dyes have lower fastness in lower depths.

FASTNESS TO WASHING

No.	Meaning
5	Excellent
4	Good
3	Fair
2	Poor
1	Very PoorLight:

Sunlight is blend of a large number of radiations of different wavelengths and thermal potentibilities. Therefore certain dyestuffs may be acted upon by the ultra violet radiations in the sunlight converting them to colourless chemicals, thus causing colour fading. Therefore for items, which are continuously exposed to sunlight, the light fastness is of importance. The best method of testing the light fastness is to expose the test specimen to sunlight along with standard dyed wool samples and to assess the fading. This needs no expense except the procurement of wool standards. The day light method suffers from the disadvantage of non-uniformity of light intensity on different days and at different places. Therefore, artificial-daylight-producing instruments (like Xenotester, Fadometer etc.) are used. Using this, the test can be done all the 24 hours.

FASTNESS TO LIGHT

No.	Meaning
8	outstanding
7	excellent
6	very good
5	good
4	fairly good
3	moderate
2	poor
1	very poor

Colour of the natural dye got from the part of the tree on fabric

Sl No.	Species	Colour of the natural dye got from the part of the tree on fabric
1	*Acacia auriculiformis* (Bark)	Brownish green
2	*Acacia auriculiformis* (Leaves)	Light Brownish green
3	*Acacia catechu* (Leaves)	Light Brownish green
4	*Acacia catechu* (Bark)	Dark Brownish green
5	*Acacia mangium* (Leaves)	Light Brownish green
6	*Acacia mangium* (Bark)	Brownish green
7	*Acacia sundra* (Bark)	Brownish green
8	*Acacia sundra* (Leaves)	Light Brownish green
9	*Adina cordifolia* (Bark)	Light Brownish pink
10	*Adina cordifolia* (Leaves)	Light Brownish pink
11	*Ailanthus excelsa* (Leaves)	Light green
12	*Albizia lebbeck* (Leaves)	Dark Brownish green
13	*Albizia lebbeck* (bark)	Dark Brownish green
14	*Albizia richardiana* (Seeds)	Light Brownish green
15	*Albizia richardiana* (Bark)	Dark Brownish green
16	*Albizia richardiana* (Leaves)	Dark Brownish green
17	*Anacardium occidentale* (Leaves)	Brownish green
18	*Artocarpus integrifolia* (Leaves)	Brownish green
19	*Cassia fistula* (bark)	Dark Brownish green
20	*Cassia fistula* (Leaves)	Brownish green
21	*Cassia siamea* (Leaves)	Brownish green
22	*Cassia siamea* (Bark)	Dark Brownish green
23	*Casuarina equisetifolia* (Bark)	Light green with greyish tinge
24	*Casuarina equisetifolia* (Leaves)	Dark green
25	*Casuarina junghniana*(bark)	Light green with greyish tinge
26	*Casuarina junghniana* (Leaves)	Dark green
27	*Chloroxylon swietenia* (Bark)	Dark Brownish green
28	*Chloroxylon swietenia* (Leaves)	Dark Brownish pink
29	*Dalbergia sissoo* (Bark)	Brownish green
30	*Dalbergia sissoo* (Leaves)	Brownish green

31	*Delonix elata* (Leaves)	Light Brownish green
32	*Delonix elata* (Bark)	Brownish green
33	*Delonix regia* (Bark)	Dark Brownish green
34	*Delonix regia* (Flowers)	Pinkish
35	*Delonix regia* (Seeds)	Light Brown
36	*Delonix regia* (leaves)	Brownish green
37	*Hopea parviflora* (Bark)	Brownish green
38	*Mellingtonia hortensis* (bark)	Brownish green
39	*Mellingtonia hortensis* (leaves)	Dark Brownish green
40	*Odina wodier* (Bark)	Brownish green
41	*Pithecellobium dulce* (Bark)	Brownish green
42	*Pterocarpus marsupium* (Bark)	Light Brownish pink
43	*Pterocarpus marsupium* (Leaves)	Light Brownish green
44	*Simaruba glauca* (Leaves)	Dark Brownish green
45	*Simaruba glauca*(bark)	Light Brownish green
46	*Ventilago madraspatana* (Roots)	Reddish pink
47	*Wrightia tinctoria* (Bark)	Brownish green
48	*Wrightia tinctoria* (Leaves)	Light green
49	*Thespesia populnea* (Bark)	Light Brownish green
50	*Thespesia populnea* (Leaves)	Light Brownish green

Colour fastness to light, colour fastness to washing for the different fabrics (natural dye)

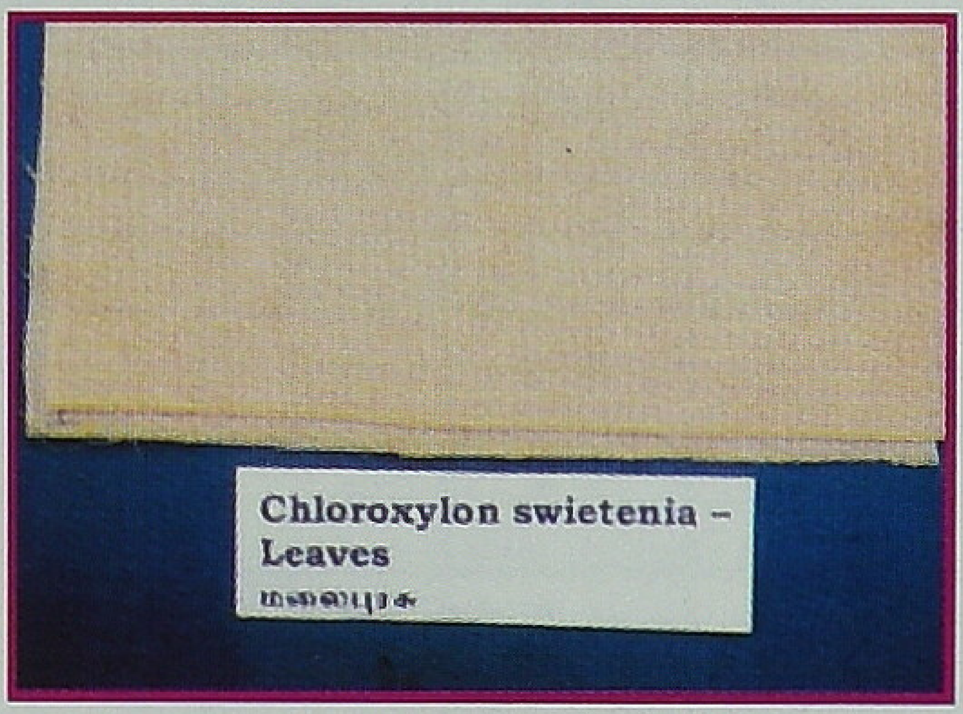
Sl. No.	Species	Colour fastness to light	Colour fastness to washing (AATCC 61:2003 - 1A Method (Temp.40C, Liq Vol.:200ml, Time 45 min., Steel balss : 10, Dec. 0.37%WOB)						
		Colour Change (After an Hr)	Colour Change	Standing on Acetate	Standing on Cotton	Standing on Nylon	Standing on Polyester	Standing on Acrylic	Standing on Wool
1	*Acacia auriculiformis (Bark)*	2.5	4.0	4.5	4.5	4.5	4.5	4.5	4.5
2	*Acacia auriculiformis (Leaves)*	2.5	2.0	4.5	4.5	4.5	4.5	4.5	4.5
3	*Acacia catechu (Leaves)*	4.0	2.0	4.5	4.5	4.5	4.5	4.5	4.5
4	*Acacia mangium (Leaves)*	4.0	2.5	4.5	4.5	4.5	4.5	4.5	4.5
5	*Acacia sundra (Bark)*	3.5	2.5	4.5	4.5	4.5	4.5	4.5	4.5
8	*Acacia sundra (Leaves)*	2.5	2.0	4.5	4.5	4.5	4.5	4.5	4.5
9	*Adina cordifolia (Bark)*	4.0	4.0	4.5	4.5	4.5	4.5	4.5	4.5
11	*Ailanthus excelsa (Leaves)*	4.0	4.0	4.5	4.5	4.5	4.5	4.5	4.5

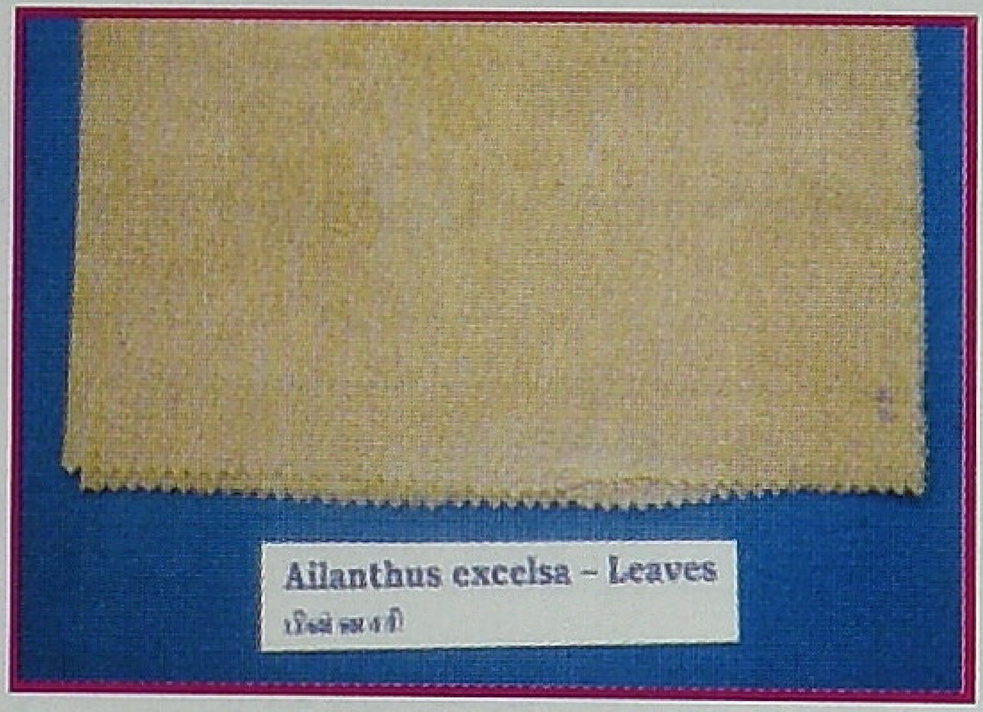
12	*Albizia lebbeck* (Leaves)	4.0	3.5	4.5	4.5	4.5	4.5	4.5	4.5
13	*Albizia lebbeck* (bark)	4.0	4.0	4.5	4.5	4.5	4.5	4.5	4.5
14	*Albizia richardiana* (Seeds)	3.5	1.5	4.5	4.5	4.5	4.5	4.5	4.5
15.	*Albizia richardiana* (bark)	4.0	4.0	4.5	4.5	4.5	4.5	4.5	4.5
16	*Albizia richardiana* (Leaves)	4.0	3.5	4.5	4.5	4.5	4.5	4.5	4.5
18	*Artocarpus integrifolia* (Leaves)	3.0	3.5	4.5	4.5	4.5	4.5	4.5	4.5
19	*Cassia fistula* (bark)	3.0	2.5	4.5	4.5	4.5	4.5	4.5	4.5
20	*Cassia fistula* (Leaves)	4.0	2.0	4.5	4.5	4.5	4.5	4.5	4.5
21	*Cassia siamea* (Leaves)	3.5	4.0	4.5	4.5	4.5	4.5	4.5	4.5
22	*Cassia siamea* (Bark)	4.0	3.5	4.5	4.5	4.5	4.5	4.5	4.5
23	*Casuarina equisetifolia* (Bark)	3.5	4.0	4.5	4.5	4.5	4.5	4.5	4.5
24	*Casuarina equisetifolia* (Leaves)	4.0	2.0	4.5	4.5	4.5	4.5	4.5	4.5
25	*Casuarina junghniana*(bark)	4.0	3.5	4.5	4.5	4.5	4.5	4.5	4.5
26	*Casuarina junghniana* (Leaves)	4.0	3.5	4.5	4.5	4.5	4.5	4.5	4.5
28	*C. swietenia* (Leaves)	4.0	4.0	4.5	4.5	4.5	4.5	4.5	4.5
29	*Dalbergia sissoo* (Bark)	4.0	1.0	4.5	4.5	4.5	4.5	4.5	4.5
30	*D. sissoo* (Leaves)	4.0	4.0	4.5	4.5	4.5	4.5	4.5	4.5
32	*Delonix elata* (Bark)	4.0	3.5	4.5	4.5	4.5	4.5	4.5	4.5
33	*Delonix regia* (Bark)	4.0	4.0	4.5	4.5	4.5	4.5	4.5	4.5
34	*Delonix regia* (Flowers)	4.0	1.5	4.5	4.5	4.5	4.5	4.5	4.5
36	*Delonix regia* (leaves)	4.0	1.5	4.5	4.5	4.5	4.5	4.5	4.5
37	*Hopea parviflora* (Bark)	4.0	4.0	4.5	4.5	4.5	4.5	4.5	4.5
38	*Mellingtonia hortensis* (b)	4.0	2.5	4.5	4.5	4.5	4.5	4.5	4.5
39	*Mellingtonia hortensis*(l)	3.5	4.0	4.5	4.5	4.5	4.5	4.5	4.5
40	*Odina wodier* (Bark)	4.0	3.0	4.5	4.5	4.5	4.5	4.5	4.5
42	*Pterocarpus marsupium* (b)	3.5	1.5	4.5	4.5	4.5	4.5	4.5	4.5
43	*Pterocarpus marsupium* (l)	3.5	4.0	4.5	4.5	4.5	4.5	4.5	4.5
45	*Simaruba glauca*(bark)	3.5	1.5	4.5	4.5	4.5	4.5	4.5	2.5
46	*Ventilago madraspatana* (Roots)	4.0	1.5	4.5	4.5	4.5	4.5	4.5	4.5
47	*Wrightia tinctoria* (b)	4.0	2.5	4.5	4.5	4.5	4.5	4.5	4.5
48	*Wrightia tinctoria* (l)	4.0	1.5	4.5	4.5	4.5	4.5	4.5	4.5
49	*Thespesia populnea* (b)	3.5	2.5	4.5	4.5	4.5	4.5	4.5	4.5
50	*Thespesia populnea* (l)	4.0	2.5	4.5	4.5	4.5	4.5	4.5	4.5

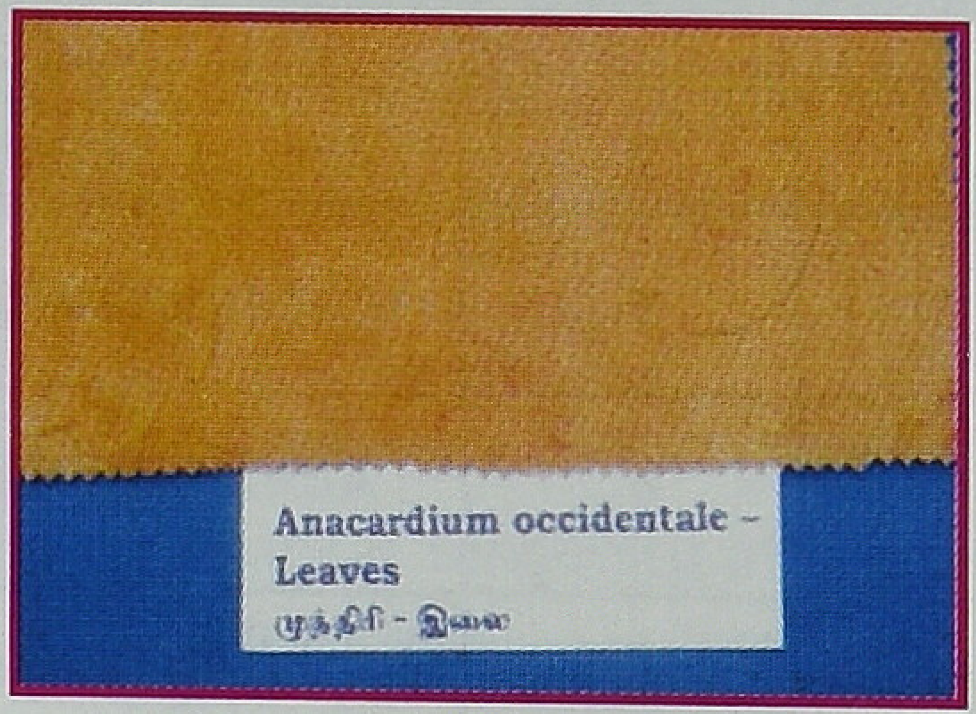
Outcome:

1. In all the cases the Staining on Acetate, staining on cotton, staining on Nylon, Staining on Polyster, Staining on Acrylic, Staining on Wool was between Good to Excellent except in case of *Simaruba glauca* leaves and Bark where the colour fastness (Staining on Wool) is between poor to fair.
2. Colour Fastness to washing - It is seen that the colour fastness to washing was good for natural dye cloth samples from bark of trees and was Poor to Fair for naturally dyed cloth samples from Leaves of the trees and was poor for naturally dyed cloth samples from seeds and flowers.
3. Colour fastness to Light - From the chart, all the samples comes between 3.5 to 4 i.e. Moderate to Fairly good for colour fastness to light.

SAMPLES OF DIFFERENT NATURAL DYED MATERIALS FROM FOREST







5. Testing the natural durability and study of mechanical properties, working qualities and effect of ammonia fumigation on fast growing secondary timber species available in Tamilnadu.

During 2000-01 an Ammonia fumigation chamber had been installed at Mettupalyam worth Rs.14,841. This is used to enhance grain pattern, increase insect resistance and change colour to darker shade permanently. If dark colour is desired wood may be treated with Ammonia fumes in closed chamber till desired colour is obtained. This enhances both improved appearance and insect resistance and is more long lasting than staining. Samples of timber from each species was taken and treated with ammonia fumes in a chamber for different durations i.e. 12 hours 36 hours 48 hours 72 hours.

Sample pieces from 15 species were fumigated using ammonia vapour for different durations.

Outcome:

i.Very strong reaction i.e. turning wood to nearly black colour is seen in the following species.

Acacia auriculiformis

A cacia mangium

Albizzia lebbeck

Albizzia odoratissima

Eucalyptus globulus

Eucalyptus grandis

Eucalyptus tereticornis

Melia dubia

ii.Reaction was found to be moderate in the following species.

Acacia suma

Artocarpus integrifolia

Acacia elata

Mangifera indica

During 2003-2004 for an Ammonia Fumigation Chamber was set up in S.F.R.I. Kolapakkam, Chennai and the following results were obtained

i.Very strong reaction i.e. turning wood to nearly black colour is seen in the following species.

1.	*Eucalyptus tereticornis*	2.	*Acacia nilotica*
3.	*Eucalyptus alba*	4.	*Eucalyptus grandis*
5.	*Eucalyptus globulus*	6.	*Albizia lebbeck*
7.	*Melia dubia*	8.	*Albizia odoratissima*
9.	*Acacia mangium*	10.	*Eucalyptus citridora*
11.	*Acacia nilotica*	12.	*Eucalyptus alba*

ii.Reaction was found to be moderate in the following species

1.	*Acacia mangium*	2.	*Peltophorum ferrugineum*
3.	*Azadirachta indica*	4.	*Casuarina equisetifolia*
5.	*Syzygium cumini*	6.	*Acacia suma*
7.	*Mangifera indica*	8.	*Grevillea roubsta*
9.	*Kaya senegalensis*	10.	*Acacia elata*

No Reaction was seen in the following species

1.	*Chloroxylon swietenia*	2.	*Gmelina arborea*
3.	*Melia dubia*	4.	*Acacia elata*
5.	*Alstonia scholaris*	6.	*Bombax ceiba*
7.	*Albizia richardiana*	8.	*Machillus macrantha*
9.	*Pterocarpus santalinus*	10.	*Kaya senegalensis*

During the current year (2004-05) twenty five secondary timber species are utilized in the above mentioned study in Mettupalayam centre. The specific gravity and mechanical properties of

wood were tested. Thus, the working qualities, effect of Ammonia Fumigation on different species of wood and mechanical properties are given detailed in the next page.

This study was conducted for secondary timber species of different age groups from different areas. Hence, there will be variation especially in the specific gravity of the wood samples and also in the mechanical properties. (Table enclosed)

6. Study to evaluate the strength of the finger joined timber from the agro-forestry species & the durability & longevity of the finger jointed timber.

The plywood industry in India is passing through shortage of traditional timbers for the manufacture of plywood. Research has shown nearly 70 species of timbers suitable for plywood but for many of the species detailed investigations are to be done for use in plywood, veneers, match boxes, match sticks and finger jointing.

This experiment was conducted to evaluate the strength of the finger joined timber from the Agro-forestry species & study the durability & longevity of the finger jointed timber.

Three Agroforestry species were sent to IPIRTI, Bangalore for the first time to test the suitability of the species for finger-jointing.The species are *Acacia suma, Grewelia robusta, Chloroxylon swietenia*. The following species are sent to IPIRTI as log form so that they convert them as per the dimensions required in the finger-jointing machine in their Institute.

S.NO	SPECIES	VOLUME OF LOG SENT TO IPIRTI
1.	Acacia suma	1.975 M^3
2.	Chloroxylon swietenia	1.784 M^3
3.	Grewelia robusta	1.871 M^3

Outcome:

Results are awaited from IPIRTI, Bangalore.

7. Utilization studies of canes

Rattan is one of the most economically important non-wood forest products (NWFP) of the moist tropical regions in Asia and West African countries. About 700 species of rattan in 13 genera have been identified. However, only six genera are currently exploited commercially. Rattan plants yield cane, an ecologically friendly alternative to material such as metals, plastic and - wood, especially in furniture, handicrafts, etc. World trade in rattan is brick with cane being imported / exported both as raw material and finished products.

Rattan form a very important source of livelihood for the rural folks, especially those who are at the bottom of the economic level. This is particularly true for large segments of the population in many Asian countries. The rattan furniture industry for Asia is quite dynamic.

The present study is done on an experimental basis to determine the effect of bleaching on canes with reference to Specific gravity, MOR and MOE both in green and air-dried condition.

This experiment was undertaken with objective of bleaching of canes and testing its mechanical qualities of bleached canes.

Since the use of hydrogen peroxide, as bleaching agent, may not be cost effective for small-scale industries, it was planned to carry out the experiment with commercial grade bleaching powder solutions (Bleaching powder-Calcium hypo chloride) with moderate concentration, starting from 5%. Three different levels of concentrations, viz 5%, 7.5% and 10% were employed for bleaching large and medium diameter rattans belonging to the species Calamus rotang. Four different bleaching durations, viz, 6 hours, 12 hours, 24 hours and 48 hours were attempted. Bleaching was done for rattans in green as well as air-dried conditions. Full length rattan rods of 3m length were bleached. After bleaching, the colour improvement was observed and graded visually .Thus ,50 kgs of bleaching powder was used for bleaching 36 canes for the present study.

Bleaching of canes:

Both green as well as air dried rattans were bleached under different treatments to find out the ideal bleaching condition and to study the effect of bleaching on the mechanical properties of rattans.

I. Air dried rattan:

The basal portion of the stem of medium category of rattans, Calamus rotang were collected and peeled. Average width of 5.0mm and thickness of 2.00 mm were selected, air dried and subjected to bleaching in a commercial grade bleaching powder solution. The solution concentrations 5%, 7.5%, 10% strength were employed. Peels were bleached in each concentration of solution for 6,12,24,48 hours. The colour improvement were observed and graded basically.

ii.Rattans in green condition:

The above mentioned procedure was followed for green Rattans too.

Outcome:

Effect of concentration of bleaching solution and duration of treatment on the colour improvement, as observed and graded visually. Results obtained for both green Rattan and Air-Dried Rattan are the same and are given below:

Effect of concentration of bleaching solution and duration of treatment on the colour improvement

Concentration of bleaching	6hours	12hours	24hours	48hours
5.0%	C	C	A	B
7.5%	C	A	A	A
10.0%	A	A	A	A

A : Pearl colour; B : Whitish colour; C : No change

MECHANICAL AND WORKING QUALITIES OF SECONDARY TIMBER SPECIES (2003-2004)

Effect of Ammonia Fumigation

a - Strong reaction, turning wood nearly black
b-Moderate / very light reaction
C-Negligible reaction

Sl. No.	Name of the Species	Hardness	Properties			Effect of Ammonia Fumigation	Colour	Grain Pattern	Spgr	Modulos of elasticity (N/mm^2)	Ultimate bending Stress(N/mm^2)
			Turning	Carving	Polish & Finish						
1.	Acacia auriculiformis	Moderately hard	Very good	Very good	Very good	a	brown	Light grain	0.736	12280.5	163.97
2.	Acacia elata	Moderately hard	Good	Good	Good	c	Pale brown	Good grain	0.55	7900.66	83.28
3.	Acacia mangnum	Moderately hard	Good	Good	Good	c	Pale brown	Good grain	0.919	11296	137.36
4.	Acacia nilotica	Hard	Good	Medium	Good	a	Brown	Light grain	0.85	5883	67.5
5.	Acacia suma	Moderately hard	Good	Good	Good	c	Brown	Good grain	0.743	8675.1	196.27
6.	Ailanthus excelsa	Soft	Bad	Bad	Good	c	Pale Yellow	Nil	0.56	-	-
7.	Albizia lebbeck	Moderately hard	Good	Good	Good	c	Pale Brown	Nil	0.7	11807.58	119.83
8.	Albizia odoratissima	Moderately hard	Very good	Very good	Verygood	a	brown	Light grain	0.6	3583.16	65.78
9.	Albizia richardiana	Soft	Bad	Bad	Very good	c	Pale Yellow	Light grain	0.34	4824.17	53.42
10.	Alstonia scholaris	Soft	Good	Good	Good	c	White	Nil	0.3	3471.2	31.97
11.	Artocarpus integrifolia	Moderately hard	Very good	Very good	Very good	a	Yellow	Nil	0.4	9152.29	67.23
12.	Azadirachta indica	Moderately hard	Good	Good	Good	b	Pale Pinkish	Light grain	0.7	6138.35	58.27
13.	Bambax ceiba	Soft	Good	Good	Good	c	Pale Yellow	Nil	0.51	8085.56	83.59
14.	Casuarina equisetifolia	Moderately hard	Good	Good	Good	b	Light Brown	Light grain	-	-	-
15.	Chloroxylon swietenia	Moderately hard	Very good	Very good	Very good	c	Yellow	Light grain	0.91	9848.86	108.31
16.	Eucalyptus alba	Very hard	Good	Medium	Good	a	Pinkish	Light grain	1.07	7668	68.4
17.	Eucalyptus citridora	Hard	Good	Good	Good	a	Pale Brown	Light grain	0.87	9158.07	100.35
18.	Eucalyptus globules	Very hard	Nil	Nil	Good	a	Greyish	Nil	1.056	9751.2	128.69
19.	Eucalyptus grandis	Hard	Good	Good	Very good	a	Pinkish	Light grain	0.508	10413.3	106.86
20.	Eucalyptus tereticornis	Hard	Good	Good	Good	a	Orangish	Light grain	1.034	9813.7	119.95
21.	Gmelina arborea	Moderately hard	Good	Good	Good	c	White	Nil	0.54	5385.82	84.55
22.	Grevillea robusta	Soft	Good	Good	Good	b	White	Nil	0.49	6162.83	65.63
23.	Kaya senegalensis	Moderately hard	Good	Good	Good	b	Pale Yellow	Good grain	0.65	8592.04	86.49
24.	Machillus macrantha	Soft	Bad	Bad	Good	c	Pale Yellow	Light grain	0.48	6030.65	72.55
25.	Mangifera indica	Soft	Good	Good	Good	c	Pale Yellow	Nil	-	-	-
26.	Melia dubia	Moderately hard	Good	Good	Good	c	Pale Pinkish	Nil	0.58	8602.67	91.84
27.	Peltophorum ferrugineum	Moderately hard	Good	Good	Good	b	White	Nil	0.64	6552.25	61.1
28.	Pinus patula	Soft	Bad	Bad	Very good	c	White	Nil	0.574	6346.7	75.73
29.	Pterocarpus santalinus	Hard	Very good	Very good	Very good	c	Pinkish	Light grain	0.82	11891.81	101.76
30.	Syzygium cumini	Moderately hard	Good	Good	Good	b	Pale Brown	Good grain	0.56	5751.3	53.17

The above Table shows the colour improvement obtained by the use of bleaching powder solutions of varying concentrations and varying treatment duration for round rod rattans in green condition and air-dried condition. Thus, bleaching of rattans both green and air-dried are best at 7.5 % solution for 12 hours in terms of colour (pearl colour). On bleaching with both green round rod Rattan and round rod Rattan air - dried, the bleaching of green round rod Rattan was having better coloration visually. It is therefore recommended to bleach the round rod rattans in green condition at 7.5 % solution for 12 hours in terms of colour (pearl colour).

Effect of variation in bleaching conditions on the mechanical properties of round rod rattans at green condition.

	5%concetration time:24 hours	7.5% concentration time:12 hours	10% concentration time:12 hours	Control
MOR (KN/mm²)modulus of rupture	92.6	98.9	85.9	72.1
MOE (KN/mm²)modulus of elasticity	5.2	8.2	3.8	3.2
MC% at test condition	12.8	12.6	12.3	4.8

It can be seen that the nature of MOR and MOE of the treated (bleached) samples are higher than untreated (control) samples. It is seen that the strength properties are the best obtained for the rattan processed with 7.5% solution for 12 hours.

8. Study on indigenious housing technology and tribal housing technology

The tribal population is found in almost all parts of the world. India has the second largest concentration of tribals in the world next to the African continent. The Indian tribes are an autochthonous people of the land who are believed to be early settlers in the Indian peninsula. In India the tribal population is 6.78 crores constituting 8.98 percent of the total population. The tribal population in Tamilnadu is 5,74,194 constituting 1.03 percent of the population. In Tamilnadu 36 tribes have been notified in the schedule as schedule tribes.

In Tamilnadu tribes found inside forest areas depend on the forest for meeting their needs. Their dependence on forests has resulted in life styles, which are unique and peculiar to them. The forests have had a profound influence on the housing technology followed by them. They were entirely dependent on the forest for construction of houses and almost all the material utilized are derived from the forests. The indigenous houses exhibit the excellent craftsmanship of the tribals. The houses depict the rich cultural heritage of the tribals. However with passage of time the traditional houses have given way to modern houses. Hence an effort has been taken to study the indigenous housing technology of tribals in different parts of Tamilnadu and to study the problems in housing technology and recommend solutions.

Conclusion:

The study had found that the design and construction of the houses were dictated by the adjoining forests. It was inferred from the study that the size of the houses were small, not suited for accommodating

the modern day amenities. The study identified the various materials used for construction of different parts of the house as walls roof and floors. The study further found that the durability of the indigenous houses was less, requiring frequent maintenance faced problems of termites and pests, leakage and unavailability of raw materials.

9. Evaluation of characteristics of energy yielding species crops to identify calorific value, oxygen content, moisture, sulphur and nitrogen: power generated per hour by the wood based gasifier

During the last twenty five years the world has seen changes that have sometimes moved full circle in the attitude to wood as fuel. The movement towards the use of oil fuels showed great promise in 1960's. Then came a sudden change in oil prices and wood, again became acceptable in many places. There are many agro-forestry species which are good energy yielder. Thus, they can be grown in larger areas outside forests and used in the gasifiers. There are several energy yielding trees grown in different centres under research wing. The trials are conducted at State Forestry Research Institute, Kolapakkam, Chennai.

The calorific value, oxygen content, moisture, Sulphur and Nitrogen of different agro-forestry species will be evaluated. The agroforestry species suitable as gasifiers can be grown in farmers land with less spacing and within 5 years. They can be felled & used in gasifiers. Thus small units of gasifiers may be installed in Panchayats, in villages, industries & many other institutions.

This experiment was under taken to evolve the characteristics of energy yield crops to identify calorific value, oxygen content, moisture, sulphur content and nitrogen content and to evolve characteristics of energy yield crops in terms of Power generated per hour in a Bio-Gasifier.During the current year (2004-05) nearly 20 species have been analysed for the following tests :

Evaluation of characteristics of energy yield crops to identify oxygen content, moisture, sulphur and nitrogen contents.

Sl. No.	Parameter	Carbon	Sulphur	Oxygen	Nitrogen	Total moisture	Volatile matter	Ash
	ProtocolProcedure)	ASTM D	ASTM D	By Diff.	ASTM D 3179	ASTM D 3302	ASTM D 3175	ASTM D 3174
	Unit	% w/w	% w/w	% w/w	% w/w	% w/w	% w/w	% w/w
1.	*Acacia auriculiformis*	48.29	0.11	45.19	0.15	4.20	79.18	0.36
2.	*Acacia leucophloea*	45.87	0.19	47.06	0.47	3.32	79.05	1.01
3.	*Acacia nilotica*	45.59	0.19	47.85	0.28	5.13	75.26	1.94
4.	*Albizia lebbeck*	45.60	0.17	48.00	0.30	6.93	79.14	1.46
5.	*Albizia lebbeck*	47.19	0.12	46.51	0.14	3.00	80.85	0.50
6.	*Azadirachta indica*	45.79	0.21	47.64	0.27	6.90	74.33	1.01
7.	*Cassia siamea*	47.56	0.10	46.02	0.37	5.30	75.08	1.77
8.	*Casuarina junghuniana*	46.57	0.12	47.02	0.17	4.50	78.91	0.28
9.	*Delonix regia*	46.46	0.10	46.98	0.41	4.90	77.03	0.86

10.	*E.camaldulensis*	50.61	0.08	43.47	0.11	3.10	74.37	0.10
11.	*Eucalyptus globulus*	45.08	0.21	48.73	0.17	7.62	72.52	0.50
12.	*Eucalyptus grandis*	47.05	0.18	46.45	0.18	5.81	77.82	0.51
13.	*Eucalyptus tereticornis*	45.71	0.14	47.84	0.44	7.19	69.80	1.81
14.	*Grevillea robusta*	48.25	0.17	48.16	0.31	4.71	77.98	1.42
15.	*Holoptelia integrifolia*	45.76	0.22	47.49	0.57	6.67	72.86	1.32
16.	*Melia dubia*	46.03	0.21	47.68	0.18	7.89	74.21	0.35
17.	*Morinda tinctoria*	44.64	0.18	48.91	0.28	4.34	70.76	2.52
18.	*Pterocarpus santalinus*	47.36	0.12	45.96	0.24	4.10	76.59	0.50
19.	*Samanea saman*	45.32	0.21	48.15	0.37	5.48	79.26	1.42
20.	*Tamarindus indica*	44.80	0.20	48.93	0.25	5.05	76.30	2.33

Outcome:

Carbon content: It is seen that the carbon content was maximum in *Eucalyptus camaldulensis* (50.61%) followed by Grevillea robustsa (48.25%)

Sulphur content: The Sulphur content was maximum in *Madhuca indica*, *Holoptelia integrifolia* (0.22%) followed by *Lueceana leucocephala*, *Azadirachta indica* (21%)

Oxygen content: The Oxygen content in the species varied mostly from 48.93% to 45%.

Nitrogen content: The Nitrogen content was maximum in *Holoptelia integrifolia* ((0.57%)followed by *Acacia leucophloea* (0.47%) and *leuceana leucocephala*(0.47%).

Volatile matter: % Volatile matter was maximum in *Albizia lebbeck* (80-85%) followed by *Eucalyptus comandulensis* (72.52%), *Maduca indica* (71.83%).

Ash content: Ash content was maximum in *Morinda tinctoria* (2.52%) followed by *Tamarindus indica* (2.33%)

Sl. No.	Species	Calorific Value (kcal/kg)	Weight of Wood (Kg)	Unit Power Generated	Time taken for burning of wood for power generation	Power produced per kg. of Wood (Unit)	Power generated per Hr.
1.	*Acacia nilotica*	4184	60	41	6 - 35	0.68	6.2 unit
2.	*Morinda tinctoria*	4184	60	23	3 - 50	0.37	6.0 unit
3.	*Tamarindus indica*	4207	60	41	6 - 00	0.68	6.8 unit
4.	*Azadirachta indica*	4219	60	30	6 - 00	0.50	5.0 unit
5.	*Eucalyptus globules*	4231	60	31	5 -10	0.51	6.0 unit
6.	*Samanea saman*	4251	60	44	7 - 30	0.73	5.8 unit
7.	*Grewelia robusta*	4261	60	39	5 - 45	0.65	6.7 unit

8.	*Acacia leucophloea*	4271	60	31	4 - 40	0.52	6.6 unit
9.	*Albizia lebbeck*	4435	60	43	7 - 55	0.72	5.4 unit
10.	*Leuceana leucocephola*	4435	60	30	5 - 50	0.50	5.1 unit
11.	*Melia dubia*	4436	60	34	5 - 00	0.56	6.8 unit
12.	*Madhuca indica*	4486	60	36	6 - 00	0.60	6.0 unit
13.	*Holoptelia integrifolia*	4490	60	30	5 - 00	0.50	6.0 unit
14.	*Cassia siamea*	4629	60	37	6 - 40	0.61	5.5 unit
15.	*E.tereticornis*	4689	60	40	7 - 00	0.66	5.7 unit
16.	*Casuarina junghuniana*	4729	60	30	6 - 25	0.50	4.6 unit
17.	*E.camandulensis*	4766	60	38	6 - 45	0.63	5.6 unit
18.	*Acacia auriculiformis*	4791	60	32	6 - 00	0.53	5.3 unit
19.	*Delonix regia*	4810	60	50	8 - 20	0.83	6.0 unit
20.	*Pterocarpus santalinus*	4959	60	28	4 - 35	0.46	6.0 unit

Power generated per hour:

The power generated per hour is maximum in *Melia dubia & Tamarindus indica* followed by *Grewelia robusta; Acacia leucophloea.*

10. Study on finding out suitable alternative fast growing agro forestry timber species to meet the requirement of the pencil making industries

During the current year (2004-05) the following species are to tested for the suitability for pencil making.

They are:

1. *Albizia odoratissima*
2. *Albizia amara*
3. *Melia dubia*
4. *Gyrocarpus jacquinii*
5. *Polyalthia longifolia*
6. *Prunus serisoides*
7. *Saraca asoka*
8. *Gmelina arborea*

Outcome:

Results are awaited.

11.Evaluation of nutrient content of different fruits available in tamilnadu

Tamil nadu has different forest types with many fruit yielding trees preffered by tribals,frugivorous birds, wild animals etc. In the present study, fruits from Forest trees are tested

for its nutrient content and are compared to the nutrient content of fruits locally available. The following fruits from forest areas were tested for nutrient content and are compared to the local edible fruits in the market.

Wild Fruits

1. *Ficus dalhousiae*
2. *Ficus comosa*
3. *Ficus infectoria*
4. *Amoora rohituka*
5. *Lantana aculeate*
6. *Ficus racemosa*
7. *Emblica officinalis*

Cultivated Fruits

1. Nelli
2. Apple
3. Elanthai
4. Sathukodi
5. Koyya
6. Green grapes

A study was conducted to compare the nutrient content of seven wild fruits with that of six cultivated fruits. The nutrients that analyzed were Carbohydrates, Protein, Fat, Calcium, Vitamin A and Vitamin C.

Nutrient analysis of edible fruits

Name of the Species	Energy Kcal/ 100g By Cal.	Fat	Carbohy drate	Protein	Fat (Cal. from Fat)	Calcium	Vitamin "A"	Vitamin "C"
		%w/w	% w/w	% w/w	Kcal/100g	% w/w	IU/100g	mg/100g
		AOAC: 2000	By diff.	AOAC: 2000	AOAC: 2000	AOAC: 2000		
Ficus dalhousiae	61.73	0.36	13.10	2.34	3.24	0.58	100	10
Ficus comosa	85.91	0.70	18.95	2.14	6.30	0.48	146	30
Ficus infectoria	47.77	0.92	7.31	3.02	8.28	0.35	38	15
AmooraRohituka	39.86	0.45	7.90	1.55	4.05	0.23	77	25
Lantana aculeate	101.67	0.24	22.45	3.83	2.16	0.32	52	10
Ficus racemosa	37.13	0.43	7.40	1.38	3.87	0.14	63	20
Emblica officinalis	57.39	0.46	13.87	0.31	4.14	0.02	92	170
Nelli	50.90	0.11	12.70	0.57	0.99	2.82	71.0	61.0
Apple	58.62	0.08	15.41	0.03	0.72	2.06	-	1.06
Elanthai(Ber)	127.64	0.09	33.06	0.64	0.81	32.6	65	4.16
Sathukodi(Mosanbi)	43.14	0.03	11.32	0.09	0.33	4.27	0.2	6.50
Koyya(Guara)	63.27	0.05	16.56	0.18	0.45	1.90	-	38.90
GreenGrapes	78.64	0.06	20.70	0.12	0.54	3.86	-	0.40

Outcome:

The results of the study revealed that In general, carbohydrates content in wild fruits were either comparable with or lower than that of cultivated fruits. Protein content in wild fruits with

the exception of *Emblica officinalis* recorded higher values compared to cultivated fruits. Similarly, all the wild fruits exhibited higher fat content than any of the cultivated ones.

In case of calcium, the cultivated fruits reported higher content than that of wild fruits.

With regard to Vitamin A content, wild fruits recorded, higher and comparable values with that of cultivated fruits. Other than *Emblica officinalis* wild fruits had higher Vitamin A content than cultivated plants except *Psidium gujava*, which reported higher content.

Both the forms of *Emblica officinalis* had higher content of Vitamin C. The results revealed that most of the wild fruits had counter parts among the cultivated fruits that had comparable energy content. The wild fruits especially *Ficus dalhousiae, Ficus comosa* and *Emblica officinalis* may be considered as good sources of Vitamin A.

Ficus dalhousiae had higher content of Proteins, Vitamin A and calcium. *Ficus comosa* had higher energy content carbohydrate content, calcium levels and Vitamin A. *Ficus infectoria* had higher fat content and protein content. *Amoora rohituka* had higher Vitamin A content. *Lantana aculeate* had higher carbohydrate, protein and energy content and moderate levels of Vitamin A. *Ficus racemosa* had moderate levels of Vitamin A.

Overall, it may be inferred that, *Lantana aculeate* and *Ficus comosa* may be recommended for cultivation by virtue of their higher energy content, while *Ficus dalhousiae, Ficus comosa* and *Emblica officinalis* may be recommend for cultivation for their higher vitamin content. Moreover the fruits with differing in quantity of nutrients may be preferred for different purposes and may be recommended for specific requirements/reasons.

12. Study on Vegetable tannins from forests

To study the % Tannin content in the different forest trees.

Analysis report

Name of species	Part used	Moisture %	Non Tannin Content %	Tannin content %	Tannin with 10 % Moisture	PH
Arto carpus hirsuta	Leaves	10.5	10.7	15.4	15.5	4.8
Arto carpus hirsuta	Bark	8.5	11.9	17.8	17.5	5.0
Mellingtonia hortensis	Leaves	11.2	8.7	13.2	13.4	5.2
Mellingtonia hortensis	Bark	7.6	7.6	17.0	16.6	5.0
Pongamtonia pinnata	Leaves	13.1	12.3	10.8	11.2	6.0
Pongamtonia pinnata	Bark	6.8	9.7	12.7	12.3	5.2
Samanea saman	Leaves	13.3	8.8	19.0	19.7	4.0
Samanea samaa	Bark	8.1	7.5	18.5	18.1	4.2
T. bellerica	Leaves	10.9	23.2	11.8	11.9	6.0
T. bellerica	Bark	8.0	21.0	10.8	10.6	5.8

Delonix regia	Leaves	12.1	11.3	16.7	17.1	5.0
Delonix regia	Bark	6.7	10.6	19.3	10.6	4.9
Albizia amara	Leaves	13.1	9.7	16.8	17.4	5.0
Albizia amara	Bark	7.2	11.3	18.3	17.7	5.0
Anognesus latifolia	Leaves	12.6	7.0	28.5	29.4	4.0
Anognesus latifolia	Bark	6.1	7.1	12.5	12.0	5.2

Result:

The Tannin content was maximum in *Anogneisus latifolia* i.e. 28.5% in the leaves where as in the other species the Tannin content in leaves was less. In *Mellingtonia hortensis, Pongamia pinnata,Delonix regia,Albizia amara* and *Artocarpus hirsutus*, the tannin content in bark was more than the leaves. In *Samanea saman, Delonix regia and Albizia amara*, the tannin content was between 16.7% to 19.3% in leaves and bark.Thus, *Anogneissus latifolia* leaves had highest tannin content followed by *Samanea saman, Delonix regia* and *Albizia amara*.

13. Study on the suitability of fast growing agro forestry species for making match splints

The match industry is one of the largest timber-consuming sectors in India. Safety matches are essential consumer commodity needed by all sections of society. Match wood should have the following qualities i.e straight grain, light weight, white in colour, no knots or cracks, capable of absorbing paraffin readily, easily peelable cheap and easily available. The result and performance of each species regarding the colour, brittleness, strength, burning properties, absorbing glue, light weight etc. were tested by giving the samples to a private match wood industry.

The following species are sent to the Joker Matches to test the suitability for match splints making (2004-2005). They are *Artocarpus integrifolia, Grevillea robusta, Syzygium cuminii, Gmelina arborea, Gyrocarpus jacquinii, Prunus serisoides, Mangifera indica, Bombax ceiba, Machillus macrantha, Alstonia scholaris.*

Splint comparison

Sl.No.	Botanical Name	Colour	Strength	Flame transfer
1.	Alstonia scholaris	Yellow	Good	Good
2.	Artocarpus integrifolia	Yellow	Good	Good
3.	Bombax ceiba	Brown	Good	Not Good
4.	Gmelina arborea	Brown	Good	Fair
5.	Grevillea robusta	Yellow	Good	Good
6.	Gyrocarpus jacquinii	Yellow	Good	Best performance
7.	Machillus macrantha	Brown black	Good	Not Good
8.	Mangifera indica	Yellow	Good	Good
9.	Prunus serisoides	Brown	Good	Fair
10.	Syzygium cuminii	Brown	Good	Fair

Outcome:

All the above species are good in strength, colour yellow and flame transfer quality is good in 8 species. Best performance as match splints from the above species is *Gyrocarpus jacquinii* followed by *Alstonia scholaris, Grevillea robusta, Artocarpus integrifolia* and *Mangifera indica.*

14. Utilization of different species of bamboo for agarbathi sticks:

The following Bamboo species were tested to find out the suitability of these species for Agarbatti stick making.

1.	*Bambusa vulgaris*	6.	*Dendrocalamus hamiltonii*
2.	*Bambusa bamboo*	7.	*Dendrocalamus longispathus*
3.	*Bambusa nutans*	8.	*Dendrocalamus embraneous*
4.	*Bambusa polymorpha*	9.	*Dendrocalamus strictus*
5.	*Dendrocalamus randisii*	10.	*Ochlandra scriptoria*

Outcome:

All the above mentioned species are suitable for Agarbathi making.

Agarbatthi made from Bamboo species

15.Survey of bamboo trade and research in tamilnadu

Bamboo is amongst the first material available in nature with which human ingenuity could interact. Much before tools were discovered bamboo was cut and split by stone tools for multifarious uses. All over the tropical and equatorial regions of the globe where it grows, bamboo in its varied and multifarious forms is still available and used.

Problems and Prospects

In most tropical countries including India, bamboos contribute substantially to generating income and employment for the rural landless and the forest fringe communities.The predominant traditional users of bamboos and rattans in the Western Ghats are the Medars, Soligas, Koravas, Sambavas, Parayas and Kavaras. These communities are spread across the three southern India states: Karnataka, TamilNadu and Kerala. in these communities. A brief description on the various research activities on bamboo has also been given.

Outcome:

The pattern of trade and research of Bamboos in Tamilnadu had been studied and various conclusions have been drawn based on the findings.

Bambusa bamboo was the species that was widely cultivated contributing more than 90 per cent share in cultivation, trade and about 40 per cent in handicrafts. Steps must be taken to introduce new species of bamboos in Tamilnadu for cultivation, trade and handicrafts. Moreover steps should be taken to provide quality seedlings with superior traits for cultivation in Tamilnadu.

On going works:

1. Bamboo Corridor: A Bamboo corridor displaying boards on Bamboo species and utilization in TamilNadu was completed around the Bamboo Hut in State Forestry Research Institute, Kolapakkam, Chennai.

2. Fabrication of furniture's: The following furniture's were fabricated in Mettupalayam and State Forestry Research Institute, Kolapakkam Ranges. In Post Harvest Technology Centre, Mettupalayam following furniture's were fabricated.

1.	*Acacia auriculiformis*	-	2 cots
2.	*Albizia lebbek*	-	Dinning table with 6 chairs
3.	*Eucalyptus toreliana*	-	3 seater sofa set

3.Utilisation of Secondary timber species for Catamaran:

During the year 2003-2004 in the Forest Utilisation Division, Research Wing,Chennai, four catamarans were fabricated from the following species i.e. *Ailanthus excelsa* and *Bombax ceiba.*

The logs used for fabricating catamarans were chemically treated with CCA in the Chemical Pressure Treatment plant in Mettupalayam and the Catamarans were handed over to the Kovalam fishermen co-operative society, Kovalam, Kancheepuram district. The four catamarans were handed over to 4 fishermen who go to the sea regularly.

Continuing the work during the year 2004-2005 one Cattamaran was fabricated out of *Melia dubia* wood in Forest Utilization range Kolapakkam . The catamaran was chemically treated in S. F.R.I, Kolapakkam and the catamaran was handed over to the Sadras Kuppam North Fiisherman Society ,Thirukalu Kundram Thaluk, Kancheepuram District.

INAUGURATION OF CONFERENCE ROOM IN S.F.R.I CHENNAI BY P.C.C.F & P.C.C.F/CHIEF WILDLIFE WARDEN

Exhibitions:

Exhibitions were held in TAP villages of Extension Centre, Chengalpattu during the JBIC Team visit to Chengalpattu Division, Chennai Circle during the year 2004-2005

Publications :

A book 'Utility of Agro- Forestry Tree Species in Tamilnadu" was published during the year 2004-2005 under integrated Forest Protection Scheme. This book gives the uses of Agro - Forestry timber species in Tamilnadu with description of their properties and uses.

Completed Experiment

COMPLETED EXPERIMENTS

1. Evaluating the suitability of leaves of different species in the production of Vermicasting

This Experiment was conducted during 2004-05 at Modern Nursery Division Dharmapuri to find out the efficiency of Vermicasting by Bio-Assay method, to find out the most suitable species for Vermicasts production and to find out the cost effectiveness in the production of Vermicasting by feeding stylo-scabra etc.,

The leaves of the following species namely

1) *Jatropha curcas* 2) stylo-scabra 3) Mini payaru 4) Vegetable waste from market and 5) The combination of the above species @ 25 kg, per species were mixed with 100kg, farm yard manure and filled in separate tubs. One tub was filled with Pressmud, Bagasse and Farm yard manure respectively in the ratio of 100 kg. 50 kg. and 50 kg. (control tub). Earth worms were released in to the tubs after the leaves in the tubs are well decomposed and Vermicasts from the individual tubs were collected separately and recorded.

Result :

The yield obtained from other leaf contribution is as follows.

Treatment	Yield (Kg)
Mini payaru leaves + Farm yard manure (100 Kg. each)	41.000
Jatropha curcas leaves + Farm yard manure (100 Kg. each)	30.200
Stylo scabra grass + Farm yard manure (100 Kgs. each)	35.750
Vegetable wastes + Farm yard manure (100 Kg. each)	32.400
Combination of above + Farm yard manure (100 Kg. each)	37.150

Combination of Mini payaru leaves, Farm yard manure (100 Kg. each) gave maximum yield of Vermicastings.

2. Provenance trial of *Tamarindus indica*

This experiment was conducted during 1990-2004 at Neyveli 'H' Block, SFRI to find out the sub-regions and provenance most suited to the sites under test for production of maximum tamarind fruit yield and pulp production. Seven provenances were planted in an espacement of 5 x 5 m.

Result :

Observations

Sl. No.	Provenance	Yield (Kg)
1.	Sethumadai	15
2.	Pulinjore	12
3.	Natham	13
4.	Arimalam	15

5.	Vridhachalam	15
6.	Dharmapuri	10
7.	Javadhu hills	18

Javadhu hill Provenance yielded maximum of 18 Kgs and it is found best performing, in Neyveli conditions.

3. Standardization of sandal plantation raising techniques

To supply the required technical know how to farming community this experiment was conducted during 1998-2005. 168 seedlings of *Santalum album* were planted in 1.5 hectare at Kolapakkam and Neyveli 'A' Block.

Result :

Observations

Neyveli 'A' Block		
Treatment	MeanGirth (cm)	Meanht (m)
T_1 - Amaranthus host	4.75	1.675
T_2 - Cholam host	3.0	1.34
T_3 - Red gram host	4.8	1.785
T_4 - Stylo host	7.2	2.66
T_5 - Cyanodon host	4.1	1.795
T_6 - Tapioca	2.05	0.95
T_7 - *Casuarina Junghuniana*	10.8	3.57

Kolapakkam		
Treatment	MeanGirth (cm)	Meanht (m)
T_1 - Amaranthus host	8.5	5.0
T_2 - *Casuarina Junghuniana* host	11.5	6.0
T_3 - Red gram host	7.5	4.2
T_4 - Altrananthra host	6.5	4.1
T_1 - Keerai host	8.5	5.0
T_2 - *Casuarina Junghuniana* host	11.5	6.0
T_3 - Thovarai host	7.5	4.2

Standardize sandal raising technique

Sandal with Casuarina host, Neyveli 'A' Block

The sandal survives and grows well with *C.junghuniana* than the other hosts in both the locations.

4. Paclobutrazol experiment in *Casuarina equisetifolia*

This experiment was started during 2002 to study the effect of Paclobutrazol application in *Casuarina equisetifolia* and to study the rate of survival, drought hardiness, shape, size and form of poles and total biomass in Neyveli 'A' Block. Pacloburrazol was sprayed in one month old seedlings and out planted.

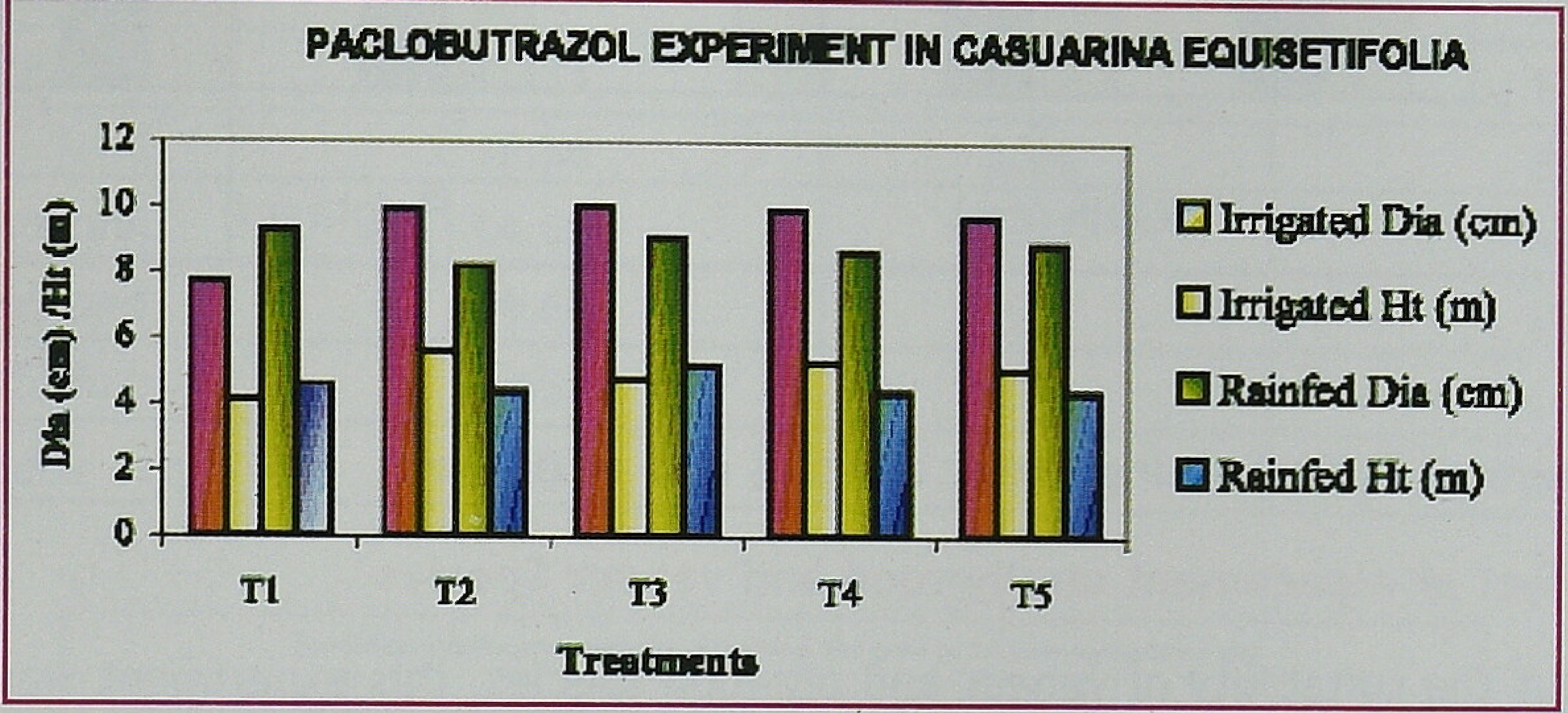
Treatment and Observations

Treatment	Dosage	Irrigated			Rainfed		
		Survival %	Dia (cm)	Height (M)	Survival%	Dia (cm)	Height (M)
T1	Control	78	7.7	4.1	74	**9.3**	**4.6**
T2	10 PPM	75	**9.9**	**5.6**	77	8.2	4.4
T3	5 PPM	75	10.0	4.8	75	**9.1**	**5.2**
T4	2.5 PPM	77	**9.9**	**5.3**	72	8.7	4.4
T5	1 PPM	71	9.7	5.1	75	8.9	4.4

Rank	Best performing treatment	
	Irrigated	Rainfed
1	T_2 & T_4	T_3

Outcome:

In irrigated condition, both T2 and T4 have performed well, but T4 is cost effective. Under rainfed conditions T3 is giving better results.



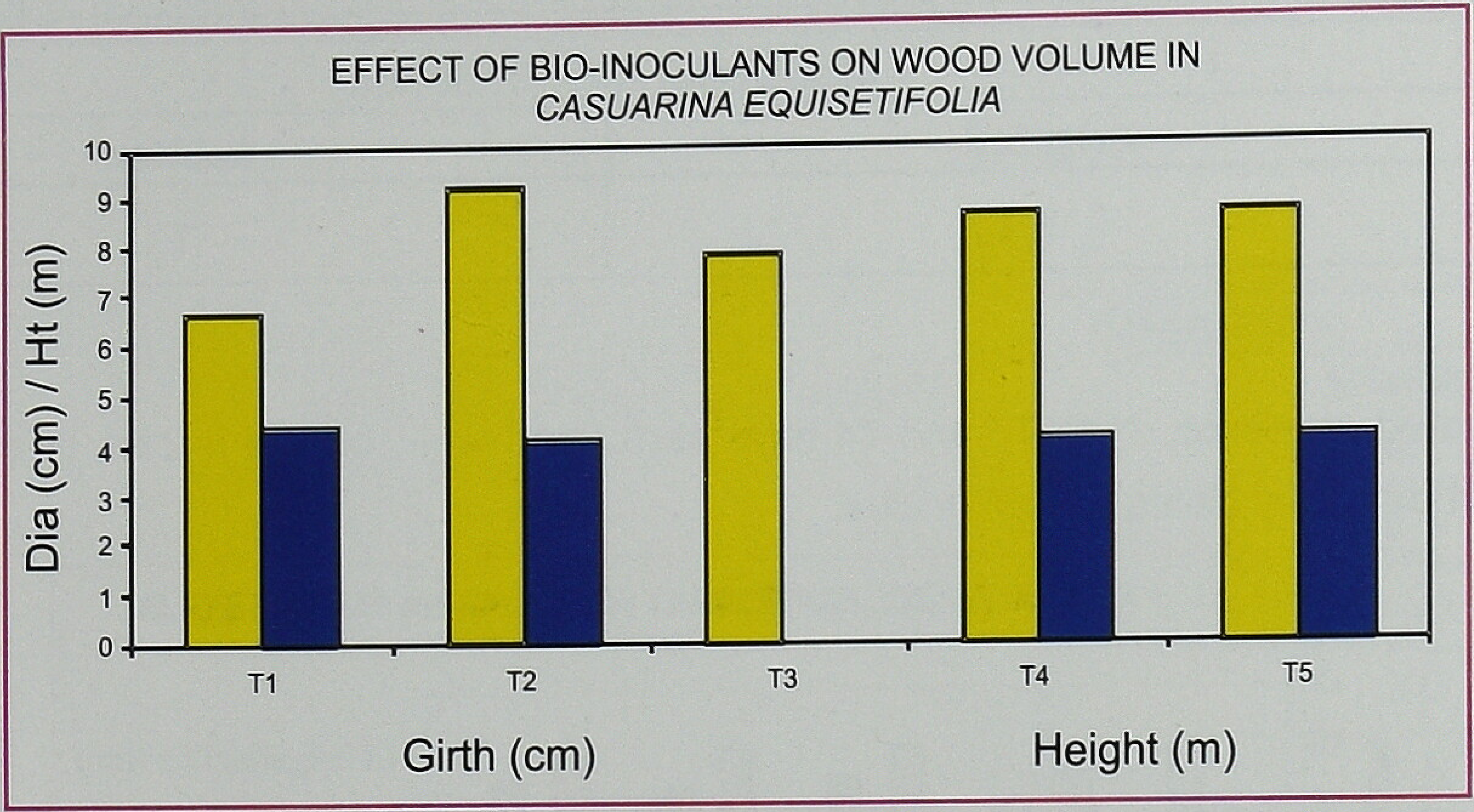
5. Effect of Bio-Inoculants on wood volume in *Casuarina equisetifolia*

To study the Effect of Bio-Inoculants on wood volume in *Casuarina equisetifolia* and to standardize the optimum dose of fertilizers, this experiment was started during 2002 at Neyveli 'A' Block.

Treatment and Observations

T_1	Control		6.7	4.4
T_2	Urea - 5g Sup.P-50g Frankia-250g VC - 250g	VAM-25g Azos - 15g Phosphobacteria-15g	9.1	4.1
T_3	Urea - 10g Sup.P-75g Frankia-250g VC - 250g	VAM-25g Azos - 15g Phosphobacteria-15g	7.8	4.0

T_4	Urea - 15g Sup.P-100g Frankia-250g VC - 250g	VAM-25g Azos - 15g Phosphobacteria-15g	8.5	4.1
T_5	Urea - 10g Sup.P-75g Frankia-Nil VC - Nil	VAM-Nil Azos - Nil Phosphobacteria-Nil	8.5	4.1



Outcome:

The treatment T_2 performing better and it is cost effective.

6. Study on effect of espacement on Plywood and veneer Species

To find out the suitability of veneer and plywood species, this experiment was started from November 2000 at Pallakulam, IWRD. *Acacia auriculiformis* and *Swietenia macrophylla* were planted in different espacement of 1.5 x 1.5 m, 2 x 2 m and 2.5 x 2.5 m in 1m^3 pits.

Performance at the end of 56th month

Species	Treatment	Survival %	Av.Height (M)	Av.Girth (cm)
Acacia auriculiformis	2.5 x 2.5	97	8.95	24
	2 x 2	94	7.46	23
	1.5 x 1.5	95	9.15	26
Swietenia macrophylla	2.5 x 2.5	89	4.46	21
	2 x 2	89	4.30	20
	1.5 x 1.5	83	5.15	22

Outcome:

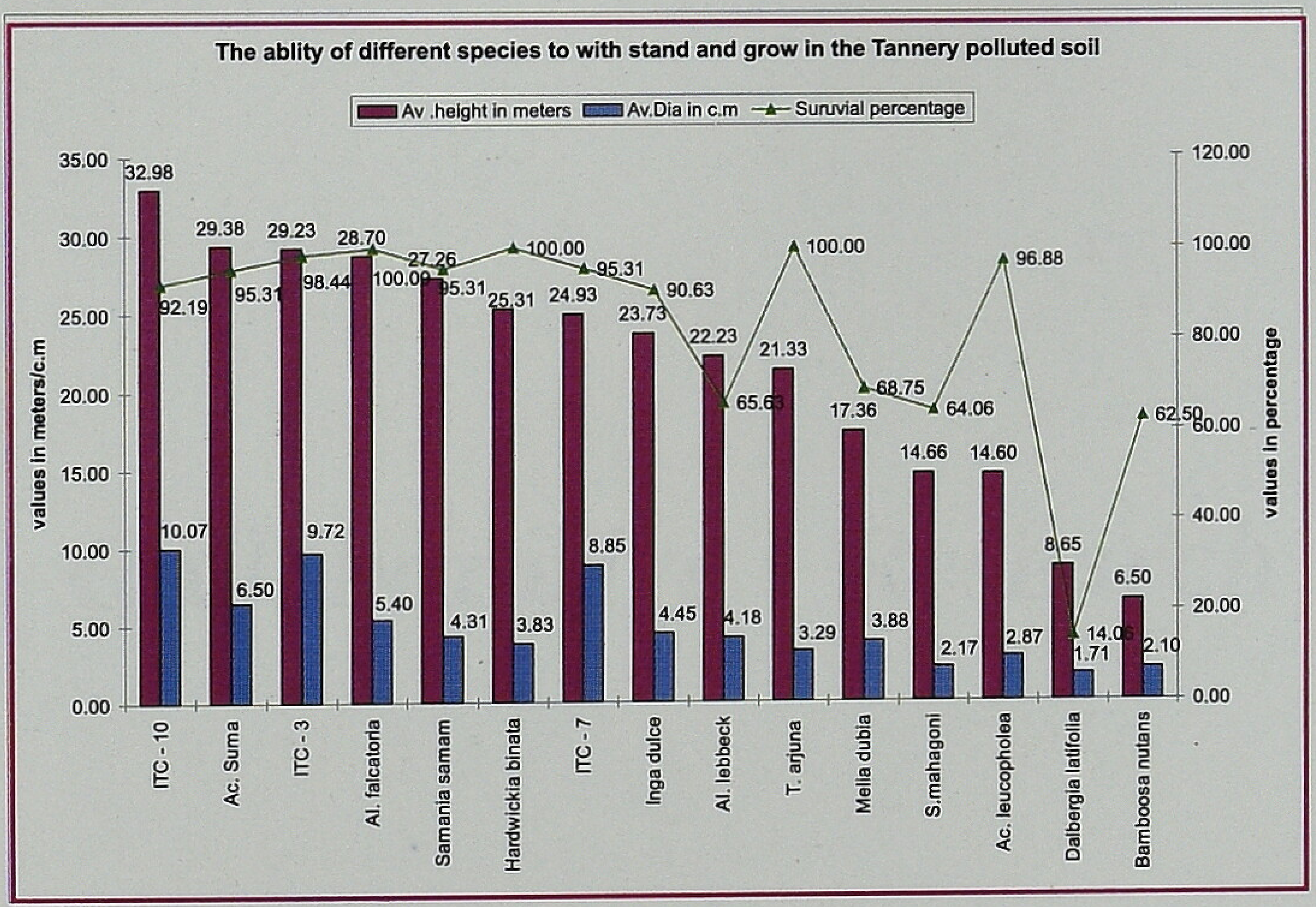
At the end of 56 months, *Acacia auriculiformis* performance is better than *Swietenia macrophylla*. Between the espacement, 1.5 X 1.5 M is found to produce better height growth and thickness.

7. Bio-remediation of polluted habitats

This experiment was started during 2001 to find the ability of different species to with stand and grow in the tannery polluted soil and to assess the relative potential of different species in absorbing the pollutants and ascertain the effectiveness of different species in utilizing the polluted water in production of bio mass at Vellore, Minor Forest Produce (R) Division, Salem.

Observations

Name of the species	Av .heightin meters	Av. Dia in cm	Survival percentage
ITC - 10	32.98	10.07	92.19
Acacia suma	29.38	6.50	95.31
ITC - 3	29.23	9.72	98.44
Albizia. falcatoria	28.70	5.40	100.00
Samania saman	27.26	4.31	95.31
Hardwickia binata	25.31	3.83	100.00
ITC - 7	24.93	8.85	95.31
Inga dulce	23.73	4.45	90.63
Albizia lebbeck	22.23	4.18	65.63
Terminalia arjuna	21.33	3.29	100.00
Melia dubia	17.36	3.88	68.75
Sweitinia mahagoni	14.66	2.17	64.06
Acacia leucophloea	14.60	2.87	96.88
Dalbergia latifolia	8.65	1.71	14.06
Bamboosa nutans	6.50	2.10	62.50



Outcome:

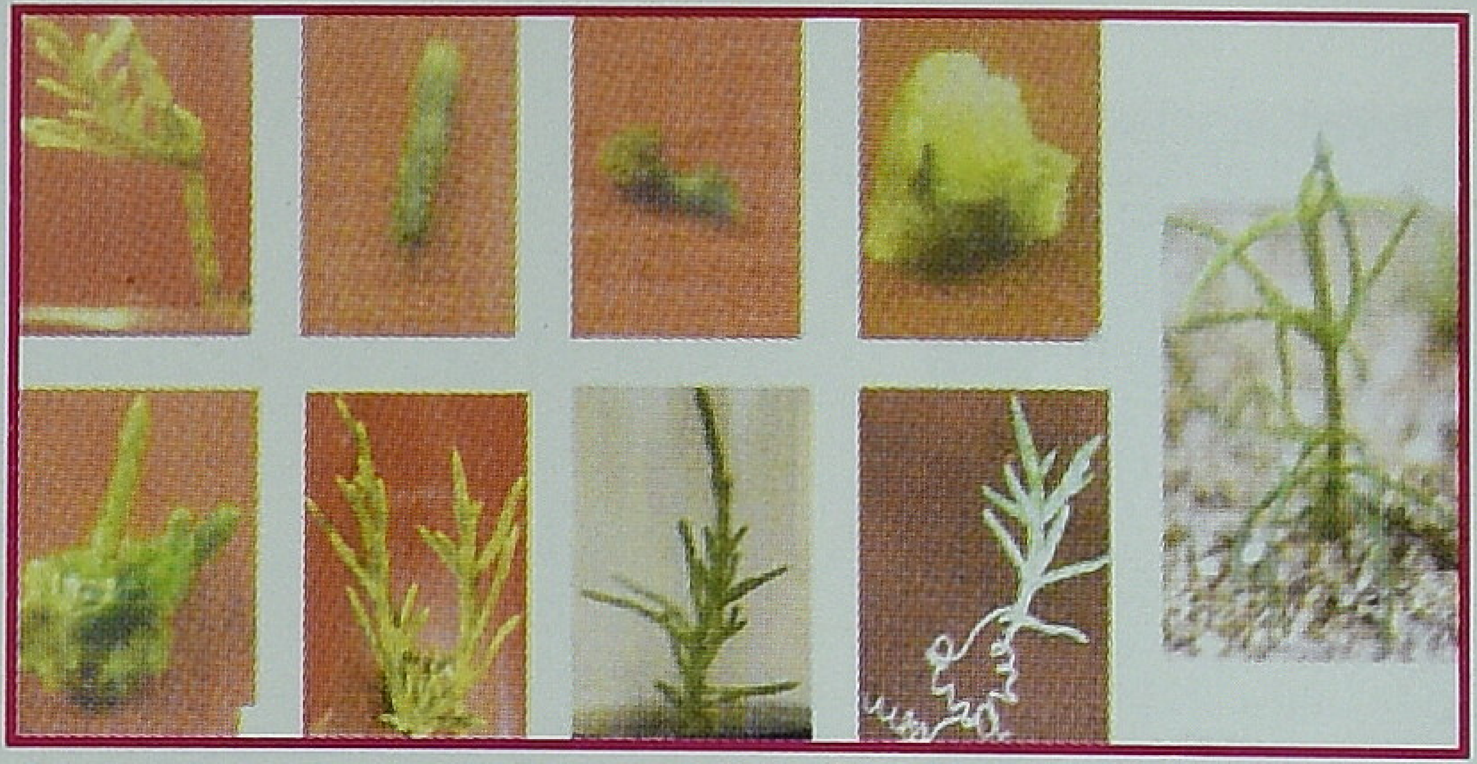
It was found that Albizia falcatoria, Hardwickia binata, Terminalia arjuna Survived the polluted conditions completely wheras, Acacia leucophloea, ITC 7, ITC10, Samania saman, TTC3 and Acacia suma were tolerant to tannery polluted soil and the other species are not successful in this soil.

Collaborative Research

THE FOLLOWING COLLABORATIVE RESEARCH PROJECTS WERE AWARDED DURING 03 -04

1. Development of transgenic Casuarina equisetifolia for salinity and drought tolerant - Dr. A.K. Gupta, Madurai Kamaraj University

The Protocal for micro propagation of *casuarinas equisetifolia* has been standardized. The study is under progress, as there has been failure in Cell bombardment technology and Gene transfer. The Principal Investigator has requested for additional time and funds. The study was started in the year 2000.



1	Aseptically produced axillary shoot
2	Axillary school explant
3 & 4	Stages in callus development
5 & 6	Multiple shooting
7	Shoot in root induction medium
8	Rooted plant
9	Plant transferred to pot

2.Micro propagation and mass multiplication of *Simaruba glauca* by Prof. K. Muregesam, Madras University

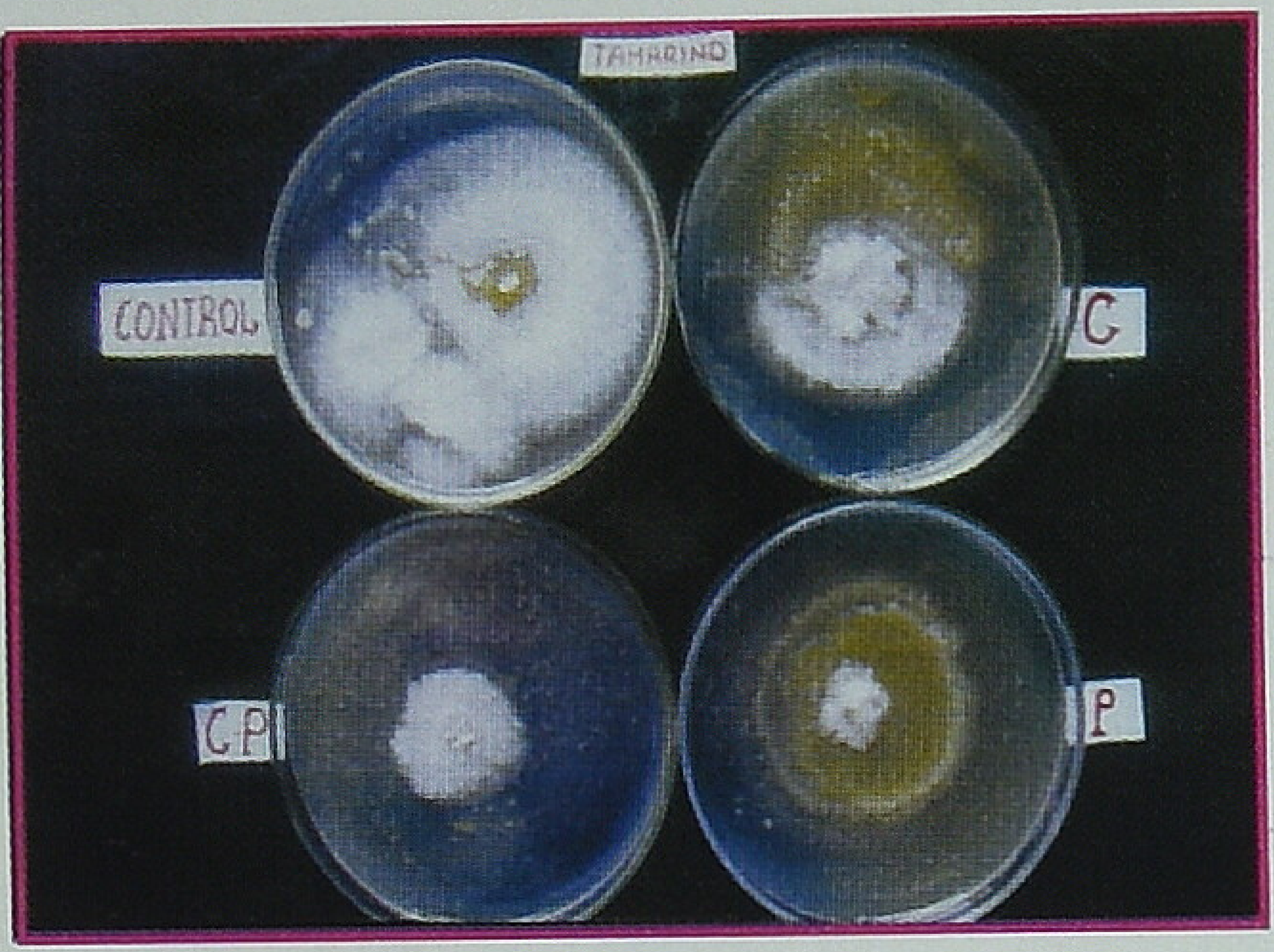
Selections of suitable explants were completed. Satisfactory results were obtained in inducing shoot and root formation. Strategies are being worked out for prevention of leaf shedding.

3. Micro Propagation and mass multiplication of *Ailanthus excelsa* by Dr. Kalaiselvisenthil, Kongu Nadu Arts and science college, Coimbatore

The research project is under progress. It will be continued this year also.

4. Micro propagation and mass multiplication of *Albizzia richardiana* by Dr. N. Raman, Madras University, Chennai

Selection of suitable plant material was completed and aseptic cultures of *Albizia richardiana* was established for mass multiplication. Shoot formation and root formation was induced. Techniques for rapid regeneration of plantlets standardized.



5. Micro propagation and mass multiplication of *Melia dubia* and *Albizzia falcatoria* and finger printing of Tamarind, Neem, Nelli and Teak by Dr. Paramathama, Tamil Nadu Agricultural University

The DNA finger printing studies for the Teak clones supplied by Forest Department were completed. Project period is extended.

6. Tamarind hybridization - production of inter specific hybrids by Dr. Nagarajan, IFGTB, Coimbatore

Seven control-pollinated full sib families and six open pollinated half-sib families of the mother trees were nursery raised and out planted.

Control pollination schedules for the year 2005-06 were conducted in four locations across agroclimatic zones. Studies on flowering and fruiting phenology and long term pollen storage have been conducted. The study is continued.

7. Microbial consortia for growth and development of trees by Dr. V. Kannan, Madras University

Microbial consortia has been developed for *Santalum album, Ailanthus excelsa, Tamarindus indica* by collecting Rhizosphere soil samples and isolating the micro organisms. The results of the studies clearly prove the effectiveness of microbial consortia on the growth and development of test plants. Microbial consortia though can enhance growth and development of plants cannot afford protection against pathogens with out a protecting agent. The inclusion of a biocontrol agent in the consortium very effectively controlled the root pathogens and hence it is very essential that the microbial consortium be equipped with some biocontrol agents for thes uccessful establishment. The project is being continued.

Laboratory Research

LABORATORY RESEARCH

I. Industrial Wood Laboratory, Mukkambu - Trichy.

The Research laboratory was established during 1969 and it is involved in scientific examination of the oil content for sandal wood, Tree born oil seed and tannin content for various species. This lab has also taken up extensive studies of preparation of various auxin and effect on rooting of unidentified Agro forestry and for various species. Now, the laboratory activities are also extending towards the finding of cost effective plant extracts on pest and diseases.

Intraction with Chief Conservator of Forest (RET) in Industrial Wood Research Lab.

Exhibiting Various Oil (T.B.Os)

ACTIVITIES OF THE LABORATORY

a) Estimation of Tree borne oils

The seed samples were collected from the following species and oil was estimated.

1. *Simaruba glauca*

72 samples collected from 1995 Simarouba seed stand (Nazareth Range) was estimated for oil content in this laboratory. The oil % varies from 40.2 to 70.5. The oil for more than 50% is tabulated below with endosperm and moisture %.

Tree No.	Moisture%	Oil % w.r.t.Endosperm
8	1.2	54.7
27	1.85	65.9
28	1.44	54.3
28	4.3	57.9
39	2.5	51.2
47	3.1	48.0
57	2.6	53.9
63	1.96	62.07
141	3.38	65.6
146	3.00	67.8
157	2.1	64.5
187	2.2	57.3

198	4.0	60.59
216	3.17	57.6
219	3.6	63.6
238	4.95	65.1
243	1.75	56.2
286	2.6	61.0
311	1.81	61.7
317	3.4	57.5
336	3.6	59.6
363	7.2	57.8
365	1.8	51.5
419	3.97	62.18
454	1.5	64.5
461	1.98	62.03
480	1.98	52.0
536	1.70	60.17
585	1.99	53.4
616	1.79	65.8
649	5.5	60.7
650	1.5	70.5
655	1.1	63.07
658	3.56	57.2
694	6.20	59.0
764	13.8	59.4
769	3.2	51.8
775	11.9	55.8
776	1.98	61.73
777	2.1	53.73
820	0.4	66.9
821	2.0	68.5
855	8.7	56.9
873	4.6	59.0
887	4.6	57.8
920	2.3	57.8
922	2.45	62.5
995	5.5	58.3
55	1.88	59.3

2. *Albizzia lebbeck*

The seeds from Jeyankondam Range gave oil % ranging from 5.1 % to 7.35%.

3. *Caeselpinia pulcherrima*

The seeds collected from CETP Dindigul of 1998 experiment plot yielded 4.77% oil.

4. *Jatropha curcas*

In order to identify the plus tree based on oil percentage the Minor Forest Produce Division has sent 32 seed samples and it was analyzed in lab and the oil percentage is tabulated below. **This result of findings helped for further propagation works.**

Clone No.	Moisture%	Oil % w.r.t.Endosperm
42	5.7	32.13
39	5.46	35.77
61	5.26	38.53
31	4.2	38.55
64	6.5	32.75
29	5.3	37.08
32	5.65	36.54
49	4.85	34.11
43	5.2	34.91
67	5.35	37.82
7	6.01	36.47
63	6.0	36.91
28	5.7	37.72
60	5.4	49.37
47	4.85	43.77
46	5.6	39.38

5. *Derris indica*

From 4 localities, the seeds were received and estimation was made.

Sl.No.	Locality	Moisture%	Oil%. W.r.t. Endosperm
1.	Kosuvapatti	33.8	14.8
2.	Kosuvapatti	9.08	34.3
3.	Genetic CPT 1	5.25	22.5
4.	-do- CPT 2	4.88	22.4
5.	-do- CPT 3	5.11	28.38
6.	-do- CPT 4	5.01	35.23
7.	-do- CPT 5	4.18	30.97
8.	-do- CPT 6	3.96	29.86
9.	-do- CPT 7	4.08	33.88
10.	CPT 1	4.95	28.62

11.	CPT 2	3.81	27.60
12.	CPT 3	4.80	34.86
13.	CPT 4	4.11	30.92
14.	CPT 5	3.86	29.76
15.	Madurai CPT 1	4.4	36.97
16.	CPT 2	4.0	36.56
17.	CPT 3	4.28	33.77
18.	CPT 4	3.86	31.03
19.	CPT 5	2.7	30.80
20.	M.F.P. Division 1 A	4.04	35.04
21.	1B	3.38	36.68
22.	1C	3.51	35.42
23.	1D	6.10	31.37
24.	1E	4.84	36.80
25.	11A	3.69	41.18
26.	11B	6.49	37.37
27.	11C	5.36	32.49
28.	11D	4.68	37.31
29.	11E	3.67	40.89
30.	111A	5.53	36.23
31.	B	3.50	37.70
32.	C	6.29	37.59
33.	D	6.82	33.76
34.	E	2.81	40.45
35.	F	11.19	36.87
36.	5TNF 2-9/D1-7	5.76	32.27
37.	6TNF 2/9/D1-8	6.9	39.56
38.	8 TNF 2/9 D1-10	10.99	39.98
39.	12 TNF 2/9 D1-14	12.92	38.89
40.	13 TNF 2/9 D1-15	13.77	38.55
41.	TNF 2/d D1-5	4.31	31.16
42.	CPT-1	5.5	31.16
43.	CPT-2	6.8	28.9
44.	CPT-3	4.0	38.55
45.	CPT-4	3.8	29.05
46.	CPT-1	5.5	43.5
47.	CPT-2	4.95	42.05
48.	CPT-3	4.88	43.9

6. *Azadirachta indica*

Seeds from various locations and from other divisions were received and the oil content was estimated and the results are tabulated below.

Location	Moisture%	Oil % w.r.t.Endosperm
VTM 82	5.36	37.60
Virudachalam 35	5.9	32.25
PV4	6.1	33.09
MKM 2	5.92	45.46
ULPT 7	6.7	40.3
Arimalam 8	5.7	32.7
El 10	6.2	38.8
Virudachalam 9	6.2	39.56
SO 6	5.1	47.39
AM 11	5.9	34.7
ULPT 3	5.87	38.78
CPT I	3.65	49.26
CPT II	5.1	37.7
CPT III	6.0	39.9
CPT IV	4.2	46.72

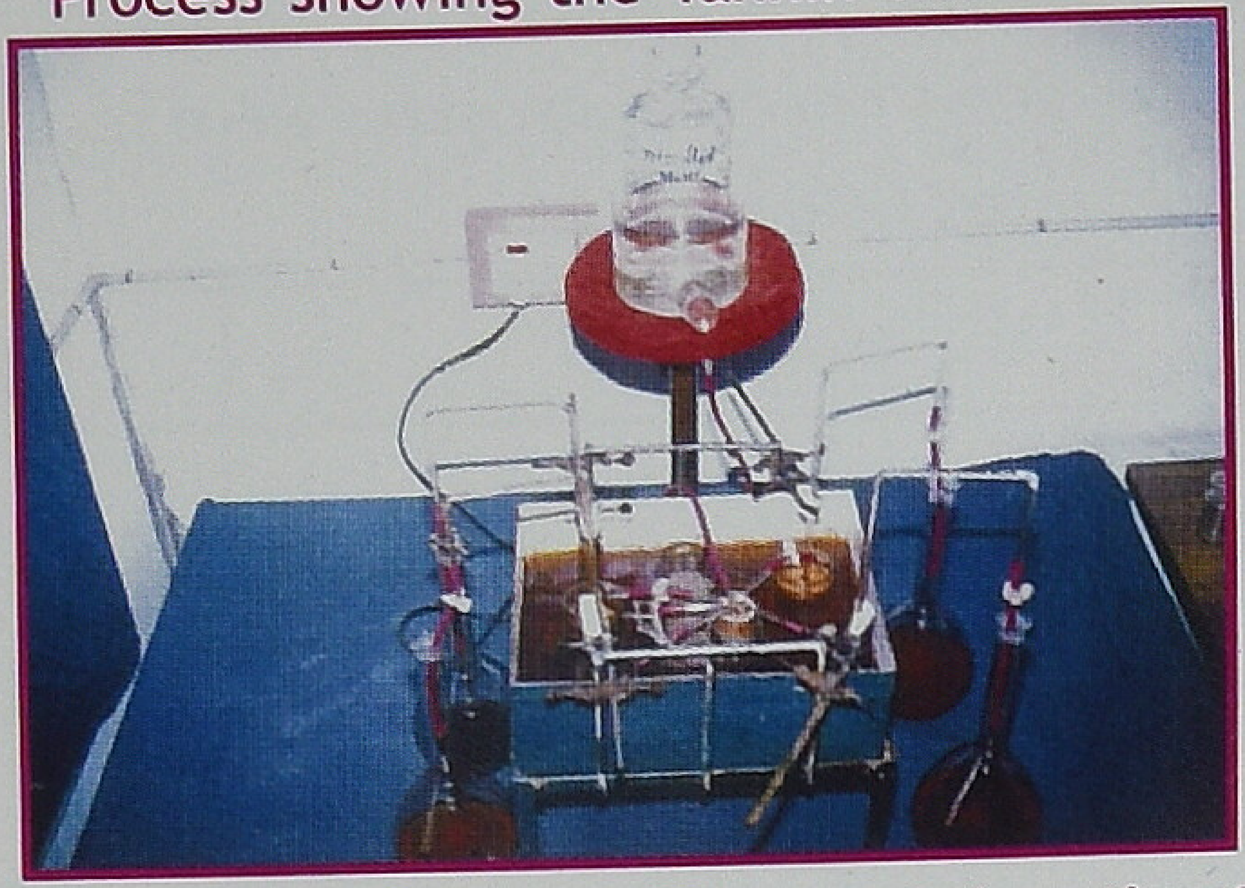
And the seeds of various species, from various localities were analyzed for oil and the results are tabulated below.

No.	Name of species	Oil %	Source of seeds
1.	Peltoform ferruginium	5.45	Dindigul CETP EP
2.	Thespesia populnea	16.28	Dindigul CETP EP
3.	Strychnus nuxvomica	8.74	F.E.O. M.R.Palayam
4.	Samanea saman	6.64	Dindigul, CETP EP graft tree
5.	Cassia fistula	67.70	Road margin tree
6.	Santalam album	64.8	Endalaparai EP
7.	Terminalia chebula	11.97	M.F.P. Division

b. STUDY OF TANNIN CONTENT

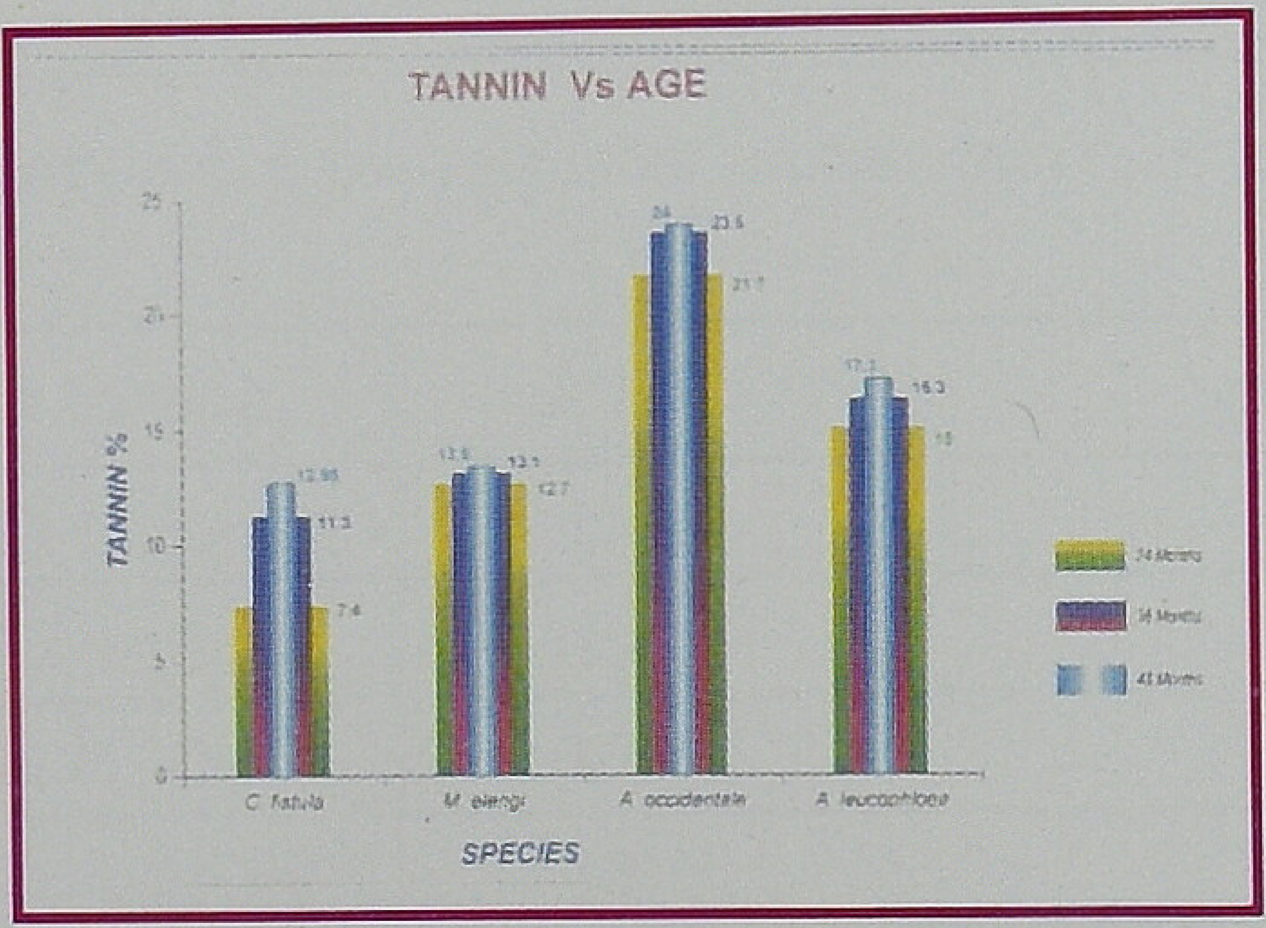
Tannin are widely distributed through the vegetable kingdom and are found in wood, bark, leaves fruits of many forest plants. Samples were received from Pudukottai Rangers and Forest Utilization Officer and analyzed in Industrial wood Research Lab and the results furnished.

Process showing the Tannin extraction



Source of samples - Arimalam 1999 Tannin & dye Experiment plot   Lab estimation period - Nov-Dec'04

Name of species	Part used	Moisture %	T.S.%	Non Tannin Content %	Tannin content %	Tannin with 10 % Moisture	PH
Mimusops elengi	**Bark**	9.25	17.88	4.53	13.35	13.46	4.01
Syzygium cumini	**Bark**	11.25	40.99	17.71	23.28	22.95	4.51
Casuarina equisetifolia	**Bark**	12.90	45.17	12.38	32.79	**31.73**	4.0
Acacia leucopholea	**Bark**	12.99	24.99	7.67	17.32	16.75	4.5
Cassia fistula	**Bark**	10.50	24.99	11.61	12.88	12.80	4.1
Anacardium occidentale	**Bark**	12.5	44.49	23.12	21.37	20.77	4.6
Cassia auriculata	**Bark**	10.9	38.52	17.84	20.68	20.47	4.5
Terminalia arjuna	**Bark**	14.2	35.71	11.85	23.86	**22.75**	3.9
Anacardium occidentale	**Leaves**	15.90	36.98	16.22	20.76	19.40	4.1



Source of sample - Mettupalayam F.U.O.   Lab estimation period -Jan - Feb.

Name of species	Part used	Moisture %	T.S.%	Non Tannin Content %	Tannin content %	Tannin with 10 % Moisture	PH
Artocarpus hirsuta	Leaves	10.5	26.1	10.7	15.4	15.5	4.8
Artocarpus hirsuta	Bark	8.5	29.7	11.9	17.8	17.5	5.0
Mellingtonia hortensis	Leaves	11.2	21.9	8.7	13.2	13.4	5.2
Mellingtonia hortensis	Bark	7.6	24.6	7.6	17.0	16.6	5.0

Pongamia pinnata	Leaves	13.1	23.1	12.3	10.8	11.2	6.0
Pongamia pinnata	Bark	6.8	22.4	9.7	12.7	12.3	5.2
Samanea saman	Leaves	13.3	27.8	8.8	19.0	19.7	4.0
Samanea samaa	Bark	8.1	26.0	7.5	18.5	18.1	4.2
Terminalia bellerica	Leaves	10.9	35.0	23.2	11.8	11.9	6.0
Terminalia bellerica	Bark	8.0	31.8	21.0	10.8	10.6	5.8
Delonix regia	Leaves	12.1	28.0	11.3	16.7	17.1	5.0
Delonix regia	Bark	6.7	29.9	10.6	19.3	10.6	4.9
Albizia amara	Leaves	13.1	9.7	9.7	16.8	17.4	5.0
Albizia amara	Bark	7.2	11.3	11.3	18.3	17.7	5.0
Anogiesus latifolia	Leaves	12.6	7.0	7.0	28.5	29.4	4.0
Anogiesus latifolia	Bark	6.1	7.1	7.1	12.5	12.0	5.2

The tannin estimation was made for 2000 TANNIN and DYE experiment plot of Arimalam research center during 2002-03, 2003-04 and 2004-05. The results of the important plants are tabulated as below:

Sl.No.	Name of species	Part	Tannin % in Age		
			24 months	36months	48 months
1.	Cassia fistula	Bark	7.4	11.3	12.88
2.	Mimusops elengi	Bark	12.7	13.1	13.5
3.	A.oocidentale	Bark	22.0	22.1	22.37
4.	T.arjuna	Bark	23	23.1	23.86
5.	A.occidentale	Leaves	21.7	23.5	24.0
6.	A.leucophloea	Bark	15.0	16.3	17.3

The results reveal that the Tannin % increases with age. Hence it is needed to retain the experiment trees for further studies to arrive maximum tannin content for economic purpose.

C. EFFECT OF PLANT EXTRACTS ON PESTS

A study was started for finding out the effect of plant extracts on pests and to develop a new ecofriendly and low mammalian toxic pesticide. Various concentration of (1,5,10%) extracts of Chloroxylon swietenia, Strychus nuxvomica, Vitex negundo, Jatropha curcas were applied an plants of **Teak, Neem, Pungan**, and **Ailanthus excelsa**. This study was began at the fag end of the year and even in this short period itself a break through was noticed and 1% of Jatropha curcas is very effective over the pests.

During 05-06 this experiment will be continued and with the assistance of JRF a final concrete result will be obtained at the end of experiment period (ie) March'2006.

D. PREPARATION OF GRS AND DISTRIBUTION DETAILS

The purpose of treating cuttings with growth Regulating substances is to increase the percentage of rooting and to hasten the root initiation.

33000gm GRS were produced and distributed to other Range/Division as follows.

Sl.No.	Name of Division/Range	Qty. of GRS supplied
1.	Minor Forest Produce, Salem	1800 gm
2.	Genetics Division, Coimbatore	1800 gm
3.	SFRI, Chennai	3600 gm
4.	Modern Nursery Dharmapuri	3700 gm
5.	Madurai Division, Madurai	200 gm
6.	Tiruchy [R] Range, Trichy Industrial wood [R] Division	4000 gm
7.	Kodaikanal [R] Range, Industrial wood [R] Division	2000 gm
8.	Pudukottai [R] Range, Pudukottai	13150 gm
9.	Jeyankondam [R] Range, Jeyankondam	1100 gm
10.	Nazareth [R] Range, Nazareth	200 gm
11.	Laboratory, Industrial wood [R] Lab, Trichy	1000 gm
	Total supply made	**32550 gm**

IBA	28250 gm
IAA	3600 gm
NAA	700 gm
	32550 gm

II. SEED TESTING LABORATORY

A. Seed Collection and Distribution

Seed is an important reproductive material and its quality is very much essential to ensure success of any Tree improvement programme. Seeds are to be collected from the known superior sources in a systematic way, transported in a proper manner, processed and stored by adopting scientific methods and distributed with proper labeling so that it can reflect the true to its maternal character in the field. Though adequate superior seed sources are not available for seeds for the Tree Seed Centre at Coimbatore, efforts are being taken to collect as far as possible from the forest areas from the phenotypes which are more than average of the population in its natural habitations.

During the current ycar seeds were collected from different seed stands, seed production areas, seedling seed orchards, clonal seed orchards by Research Rangers and made available to the Tree Seed Centre under the control of Research Ranger, Seed Storage, Coimbatore. Simaruba seeds were procured from Orissa Forest Department. Medicinal plant seeds were collected from the wild and also purchased from different sources.

Details of Cleaned seeds from April 2004 to March 2005 in Seed Storage Range, Coimbatore

Sl.	Name of Seeds	Sl.	Name of Seeds	Sl.	Name of Seeds
1	Acacia auriculaeformis	41	Dendrocalamus strictus	81	Musua ferrea
2	Acacia concinna	42	Derris indica	82	Parkinsonia aculata
3	Acacia elata	43	Dendrocalamus gigantius	83	Peltophorum ferrugenium
4	Acacia ferruginea	44	Diospyrus ebenum	84	Pheoneix dactylifera
5	Acacia holosericea	45	Dioscorea sp	85	Phoenix sylvestris
6	Acacia leucophloea	46	Divi divi	86	Phyllanthus amarus
7	Acacia mangium	47	Dysoxylum malabaricum	87	Pinus oocarpa
8	Acacia nilotica	48	Ealeodendron glaucum	88	Polyalthia coffeoides
9	Acacia senegal	49	Eleocarpus serratus	89	Pterocarpus marsupium
10	Agalia roxburghiana	50	Emblica officinalis	90	Pterocarpus santalinus
11	Ailanthus excelsa	51	Eucalyptus astringens	91	Rauwfolwia tetraphylla
12	Albizia amara	52	Eucalyptus camaldulensis	92	Riversdale gauna
13	Albizia lebbeck	53	Eucalyptus citriodora	93	Santalum album
14	Andropogon guanensis	54	Eucalyptus diversicolar	94	Prosophis juliflora
15	Annona squamosa	55	Eucalyptus grandis	95	Sapindus emarginatus
16	Anogeissus latifolia	56	Eucalyptus oleosa	96	Spondias mangifera
17	Artocarpus hirsutus	57	Eucalyptus marginata	97	Spondias pinnata
18	Atriplex nummudiea	58	Eucalyptus salemonaphloia	98	Simarouba glauca
19	Azadirachta indica	59	Eucalyptus tereticornis	99	Strychnos nux-vomica
20	Bahuinia racemosa	60	Eugenea jambolana	100	Strychnos potatorum
21	Bambusa bamboo	61	Felicium decipens	101	Stylo scabra
22	Bischofia javanica	62	Feronia elephantum	102	Stylociat 136
23	Brachiania humidicola	63	Garcinia gummicutta	103	Swietenia mahagony
24	Brachiania olecumbenii	64	Givotia rottleriformis	104	Tamarindus indica
25	Bridelia retusa	65	Gmelina arborea	105	Tectona granids
26	Calophyllum innophyllum	66	Grewia tiliefolia	106	Tecoma undulata
27	Canaga odorata	67	Hardwicka binata	107	Terminalia arjuna
28	Canariam strictum	68	Holoptelea integrifolia	108	Terminalia bellarica
29	Cassia senna	69	Hopea wighitiana	109	Terminalia chebula
30	Cassia siamea	70	Jacaranda mimosifolia	110	Terminalia paniculata
31	Casuarina junghuniana	71	Jatropha curcas	111	Terminalia tomentosa
32	Ceiba pentendra	72	Khaya nasika	112	Tetrameles nudiflora
33	Cenchrus cilliaris	73	Khaya senegalensis	113	Thespesia populena
34	Congo singal brokernia	74	Lab lab highworthi	114	Vaterica roxburgiana
35	Corymbia calophylla	75	Lagerstromia speciosa	115	Vaterica indica
36	Culania excelsa	76	Lagerstromia lanceolata	116	Wrightia tinctoria
37	Cycas cyrcinalis	77	Leucaena leucocephala	117	Zizyphus jujuba
38	Dalbergia latifolia	78	Mallotus phillipensis	118	Zizyphus xylophyrus
39	Dalbergia sissoo	79	Melia dubia		
40	Delonix regia	80	Myristica malabarica		

B. Developing Seed Technology

1. Developing technology for seed biology for 10 dominant species in evergreen forests - Pollachi.

The following species were taken up for this experiment

1) Canarium strictum
2) Vateria indica
3) Hopea parviflora
4) Mesua ferra
5) Bischofia javanica
6) Nephelium longana
7) Dysoxylon malabaricum
8) Semicarpus anacardium
9) Artocarpus hirsutur
10) Callophyllum elatum

Seeds of all the species were collected in the respective fruting season. The date of seed collection germination details etc are tabulated as follows.

Sl.No.	Name of Species	Date of Sowing	No. of seeds sown	Germination details
1.	Canarium stictum	26.6.04	100	Nil
		3.4.05	50	24
2.	Veteria indica	26.6.04	100	23
		7.6.05	25	6
3.	Hopea parviflora	15.7.04	100	Nil
		7.06.05	25	Nil
4.	Mesua ferrea	10.6.0	100	Nil
		5.1.05	100	15
5.	Bischofia javanica	8.2.05	100	Nil
		18.2.05	100	Nil
6.	Nephelium longana	25.2.04	100	Nil
		18.2.05	100	Nil
7.	Dysoxylon malabaricum	26.7.04	50	25
		27.9.04	50	Nil
8.	Semicarpus anacardium	1.8.04	100	Nil
		23.3.05	100	Nil
9.	Artocarpus hirsutus	10.7.04	50	Nil
		30.3.05	100	Nil
10.	Callophyllum elatum	26.7.04	10050	Nil
		5.1.05	50	Nil

Seed biology tests for the seeds of above species are also carried out in the seed testing lab at Deputy Conservator of Forests Office, Coimbatore and the germination details are recorded in the Germination Register.

2. Developing seed biology of eight dominant species of dry deciduous forests

10 dominant trees of dry deciduous forest in Sathyamangalam forest were asked to be identified for study of phenology and for collection of seeds and development of seed technology. Out of the 10 species CPTs were identified by the Ranger in respect of the following.

1) Gyrocarpus jaquinii
2) Chloroxylon swietenia
3) Commiphora caudate
4) Holoptelia integrifolia
5) Emblica officinalis

In addition to the above species CPTs of Bosewellia serrata, Shorea tolura and Acacia sundra were also identified. In all the above species, seeds were collected and nursery trials were done. Adequate no. of seedlings were raised and kept for use. Seeds were also made available to the laboratory for testing. CPTs have been brought into account in CPT register.

3. Developing seed biology for 10 dominant trees in moist deciduous forests

Out of seven species of moist deciduous forests, as per the write up, CPTs were selected in case of Albizzia odorotissima, Albizzia procera, Terminalia bellarica and Bridelia retusa. CPTs details are as follows : Albizzia procera - 5 Nos. in Sadivayal area. Terminalia. bellarica - 3 Nos. Sadivayal area, Bridelia retusa - 4 Nos. in Sadivayal area, and Albizzia orodotissima - 4 Nos. in Sadivayal area. Seeds were collected, seedlings were also raised. Efforts are made to identify dominant trees in respect of Terminalia arjuna, Melia azadirach and Melia dubea.

C.Seed Carpology

This is also known as Seed carpology museum. It has much of use and utility both in academic and practical aspects. In the era of world trade, biological resources are gaining prominence and even scientists and well-educated people want to see and know the seeds, an important reproductive material of the plant varieties for various purposes. The Genetics divisions with its vast experience in handling tree seeds for decades together have created a good collection of seeds through the facilities available at Seed centre Coimbatore and Seed Laboratory, Ooty.

D. Shola Laboratories

1) Establishment of Shola Laboratory at Ooty

This shola lab was started with an object of developing Seed technology of Shola species of Tropical Montane temperate forests. A literate mazdoor engaged for population dynamic study is being utilized for laboratory. Initially there was no systematic approach for conducting laboratory trials, but later on, the observations were recorded. The seed technology was developed for the following species during 2004-05.

1. Syzygium callophylifolium (lab and mist tent condition)
2. Mahonia leschanaultii (Lab and mist tent condition)

3. Eleagnus couferta (Lab condition)
4. Evodia roxburghiana (Lab and mist tent condition)

The work was in progress for the following 9 species as on 31.3.2005.

1. Todolia aciatica
2. Michelia nilgirica
3. Eleocarpus munreii
4. Eleocarpus oblongus
5. Symplocos cochinchinensis
6. Viburnum erubesence
7. Pygeum gardinari
8. Sidroxylon tomentosa
9. Litsea sps.

As on 31.3.2005, the following seed lots are available. The seeds were collected from all over the district of Nilgiris.

Sl. No.	Name of Species	Family	Ooty Research Range, Shola lab, Ooty
1.	Acacia mearnsii	Mimosaceae	✓
2.	Acacia melanoxylon	Mimosaceae	✓
3.	Bereberis tinctoria	Berberidaceae	✓
4.	Canarium strictum Roxb.	Burseraceae	✓
5.	Celtis cinnamomea	Ulmaceae	✓
6.	Celtis tetrandra	Ulmaceae	✓
7.	Celtis wightii	Ulmaceae	✓
8.	Cinnamomum wightii	Lauraceae	✓
9.	Crotalaria ovalifolia	Leguminosae	✓
10.	Daphiniphyllum nilghrrense	Euphorbiaceae	✓
11.	Digitalis purpurea		✓
12.	Dodonaea viscose (L.) Jacq.	Sapindaceae	✓
13.	Drosera peltata		✓
14.	Elaecorpus munroii	Elaeocarpaceae	✓
15.	Elaeocarpus ferrugenious	Elaeocarpaceae	✓
16.	Elaeocarpus oblongus	Elaeocarpaceae	✓
17.	Elegnus conferte	Elaeocarpaceae	✓
18.	Eovida roxburghiana	Rutaceae	✓
19.	Eucalyptus citriodora	Myrtaceae	✓
20.	Eurya japonica	Ternstromiaceae	✓
21.	Garcinia gummigutta	Glusiaceae	✓

22.	Glochidion neilghrense	Euphorbiaceae	✓
23.	Hydonocarpus alpinaq	Bixaceae	✓
24.	Ilex denticulate Wall. ex Wight.	Aquifoliaceae	✓
25.	Ilex wightiana Wall.	Ilicianae	✓
26.	Jacaranda mimosifolia	Bignoniaceae	✓
27.	Litsea wightiana	Lauraceae	✓
28.	Mahenia leschaunaltii	Berberidaceae	✓
29.	Mappia foetida		✓
30.	Meliosma wightii	Sabiaceae	✓
31.	Michelia nilagricia	Magnoliaceae	✓
32.	Microtropis ovilifolia	Celastraceae	✓
33.	Microtropis ramifolia	Celastraceae	✓
34.	Myrsina wightiana	Myrsinaceae	✓
35.	Neolitsea zeylanica	Lauraceae	✓
36.	Olea glandulifera	Oleaceae	✓
37.	Photinia notoniana	Rosaceae	✓
38.	Piper longnum	Piperaceae	✓
39.	Pittospermum neilgherrense	Pittosporaceae	✓
40.	Pittospermum tetraspermum	Pittosporaceae	✓
41.	Polygala airlata	Polygalaceae	✓
42.	Prinsipia utilis	Rosaceae	✓
43.	Pygeum gardineri	Rosaceae	✓
44.	Rapanea capitellata	Myrsinaeceae	✓
45.	Rauwolfia tetrophylla	Apocynaceae	✓
46.	Rhamnus wightii	Rhamnaceae	✓
47.	Rhododendron nilagiricum Zenk	Ericaceae	✓
48.	Rodemyrtus tomentosum		✓
49.	Rosa leschenaultiana	Rosaceae	✓
50.	Rubus mollucanus	Rosaceae	✓
51.	Rubus racemosa	Rosaceae	✓
52.	Scheffera rostata	Araliaceae	✓
53.	Sideroxylon tomentosum	Sapotaceae	✓
54.	Solanum indicum	Solanaceae	✓
55.	Solanum sisymbrifolium	Solanaceae	✓
56.	Solanum verbasifolium	Solanaceae	✓
57.	Sophera glauca	Papilionaceae	✓
58.	Swietenia macrophylla	Meliaceae	✓
59.	Symplocos cochinchinensis	Symplocaceae	✓

60.	Syzygium arnotianum	Myrtaceae	✓
61.	Syzygium calophyllifolium	Myrtaceae	✓
62.	Syzygium montana	Myrtaceae	✓
63.	Ternstromia japonica	Theaceae	✓
64.	Toddalia asiatica (L.) Lam	Rutaceae	✓
65.	Turpunia nepalensis	Staphleaceae	✓
66.	Vaccinium leschenaultii	Vaccinaceae	✓
67.	Vernonia arborea	Compositae	✓
68.	Viburnum erubusense	Caprifoliaceae	✓

Seed Technology Developed

Sl. No.	Name of Species	Max Germination Obtained	Purity Percentage	Moisture Percentage	No of Seeds per Kg.
1.	Syzygium callphyllifolium	100%	95%	12.5%	3300
2.	Mahonia leschanaultii	90%	80%	7.5%	40000
3.	Eleagnus conifera	80%	90%	17%	8000
4.	Eovida roxburghinia	45%	90%	11.28%	60000

2. Establishment of Shola lab at Topslip

A shola lab has been established at Topslip near Karian shola. The facility is utilized for creation of Seed herbarium and for studying germination and nursery practices for shola species available at Karian shola, Anakundhi shola and Manomballi shola. The facilities available are very meager and currently only Seed herbarium is being tried. Following are the species for which seed samples are available in the Herbarium. It serves the purpose of referencing.

Sl. No.	Species Name	Family	Local Name
1.	Acronychia laurifoli	Rutaceae	Vidukanalai
2.	Adina cordifolia	Rubiaceae	Manjakadambai
3.	Aglaia roxburghiana	Meliaceae	Thondupulian
4.	Albizzia procera	Mimosoideae	Valla vagai
5.	Artocarpus gumegianis	Moraceae	Legusa
6.	Artocarpus hirsutus		
7.	Baccaurea courtialencis	Euphorbiaceae	Makki / Solai puli
8.	Bishofia jawanica	Euphorbiaceae	Solai vengai
9.	Bridelia retusa	Euphorbiaceae	Mul vengai
10.	Calamus travancoricum		Mani pirambu
11.	Calophyllum elatum	Guttiferaceae	Kattu punnai
12.	Cassia tora	Ceasalpiniaceae	Oosi thagarai
13.	Cinnamomum zylanicum		
14.	Cullenea excorilata		Kanji pala

15.	Cycas ciricinalis		
16.	Dalbergia latifolia		Eetti
17.	Diospyros montana	Ebenaceae	Vakkanai
18.	Dysoxylum malabaricum	Meliaceae	Vellagil
19.	Eleocarpus munroii	Eleocarpaceae	V. Ruthratcham
20.	Eleocarpus serratus	Eleocarpaceae	K. Ruthratcham
21.	Eleocarpus tuberculatus	Eleocarpaceae	Neela Ruthratcham
22.	Eleodenron glaucam	Celastraceae	Kanneera maram
23.	Eriolena hookriana	Sterculiaceae	Uduppai
24.	Ficus callosa		
25.	Ficus mysorensis	Moraceae	Kal Aal
26.	Ficus religiosa	Moraceae	Arasu
27.	Flacourtia indica	Bixaceae	Kodi Karai
28.	Garcinia gummigutta	Guttiferaceae	Kodampuli
29.	Gardinia gummifera	Rubiaceae	Kambali maram
30.	Gmelina arborea	Verbinaceae	Kumizh
31.	Harpulia imbericata	Sapindaceae	Attapattai
32.	Hydnocarpus wightiana	Bixaceae	Maravetti
33.	Mecaranga peltata		
34.	Mesua ferrea	Guttiferaceae	Nangu
35.	Myristica dactiloides	Myristicaceae	Kattui Jathikkai
36.	Myristica malabarica	Myristicaceae	Jathikkai
37.	Nephelium longana	Sapindaceae	Solai Poovathi
38.	Nothopegia colebrokiana	Anacardiaceae	Kattu iluppai
39.	Polaquium ellipticum	Sapotaceae	Poly maram
40.	Polyalthia coffoides		Nedu Naari
41.	Polyalthia rufescens		
42.	Randia pumetorum	Rubiaceae	Madhukarai
43.	Rauvolfia serpentine		
44.	Rauvolfia tetraphylla	Apocynaceae	Pambukala
45.	Schelechera oleosa	Sapindaceae	Poovathi
46.	Spondius pinnata		
47.	Sterculia villosa		
48.	Swietenia macrophylla	Meliaceae	Mahogani
49.	Terminalia bellarica	Combertaceae	Thani
50.	Trewia nudiflora	Euphorbiaceae	Thavalai
51.	Vatica roxburghiana	Dipterocarpaceae	Vallapaguni
52.	Vitex altissima		
53.	Zizyphus trinervia		Karikattan

The Herbarium specimens collected and preserved in this center are being transferred to Division office at frequent intervals for further maintenance. The surplus seeds are being transferred to Topslip nursery for nursery trial. Efforts are being made to increase the Seed samples in the Seed herbarium in the Shola lab.

III. BIO-FERTILIZER LABORATORY

Modern Nursery Division, Dharmapuri produces Vermicastings, VAM, Azospirillum, Phosphobacteria, Rhizobium, Azotobacter, pseudomonas fluorescens and Trichoderma viride in large scale by updating the knowledge and skill.

Vermicasting

The Modern Nursery Division is pioneer unit with regard to the production of Vermicasting and also serves as a perennial source for supply of Vermicasting. The Modern Nursery Division is capable of producing 3000 M.T. per annum. The Vermicasting produced in Modern Nursery Centres is of superior quality.

Production of Vermicasting

	2000-01	2001-02	2002-03	2003-04	2004-05
Quantity in Kg.	100530	559210	1758347	244194	426315

VAM (Vesicular Arbuscular Mycorrhizae)

Modern Nursery Division is the pioneer with respect to large scale production of VAM among the Government Departments and is capable of producing 1000 M.T. of VAM per annum. VAM produced from the Modern Nursery Centres of this division excels in quality and is being supplied to Government Department like Forest, Agriculture, Horticulature, TAFCORN, etc., and Schemes like Tamilnadu Afforestation Project (TAP), Forest Development Agency, Comprehensive Wasteland Development Programme etc.,

Production of VAM

	2000-01	2001-02	2002-03	2003-04	2004-05
Quantity in Kg.	120000	67340	5600	147833	61000

Production of Azospirillum, Phosphobacteria and Rhizobium

The Modern Nursery Division is producing Azospirillum, Rhizobium and Azotobacter which are bacteria. These are nitrogen fixing bacteria either free living or symbiotic. And Phosphobacteria is also produced. This bacteria helps in solubilizing Phosphorous. Modern Nursery Division, Dharmapuri is capable of producing 180 Tons of Bio-fertilizer per year.

Types of Bio-fertilizer

Sl. No.	Bio-Fertilizer	Function	Crop
1.	Rhizobium	Nitrogen fixation	Legume plants
2.	Azospirillum	Nitrogen fixation	All crops
3.	Phosphobacteria	Phosphate solubilization	All crops
4.	Azotobacter	Nitrogen fixation	All crops

Production of Bio-Fertilizers

	2000-01	2001-02	2002-03	2003-04	2004-05
Quantity in Kg.	28184	60850	130065	81722	114053

Apart from this Trichoderma viride and Pseudomonas fluorencens, the Bio-Control Agents are produced in Modern Nursery Division.

IV. SOIL TESTING LABORATORY

A soil testing laboratory is functioning at State Forest Research Institute, Kolapakkam, Chennai to support forestry research through analysis of soil samples for enabling tree cultivation. Soil physical parameters such as colour, texture, soil reaction (pH), Soluble salt content etc. are tested and chemical properties such as Calcium carbonate status, available nitrogen, available phosphorus and available potassium are tested. Every year samples are received from Energy wood division, Social forestry division and TAP and the analyzed results are being sent. Proper recommendations are given in case of problem soils like acid soils, saline soils and alkaline soils. The quantity of gypsum to be applied for alkaline soils and the lime requirement for acid soils for each pH are being prescribed.

During the current year apart from the routine parameters the soil moisture content was tested at 60cm depth soil for the experiment on effect of organic mulching where eight treatments namely paddy straw, saw dust, wood shavings, dry leaves, Casuarina needles and polymer were applied. Soil moisture content was tested before and after treatment. Totally 596 Nos. of samples were analyzed and results provided.

Other Achievemnt

OTHER ACHIEVEMENT

I. Production of seedlings for Comprehensive Wasteland Development Programme

<table>
<tr><th>Sl. No.</th><th>Name of the Division</th><th>No. of Seedlings</th><th>Species Name</th></tr>
<tr><td>1</td><td>Deputy Conservator of Forests,
State Forest Research Institute,Chennai.</td><td>15000</td><td rowspan="4">Neem
Paradise
Vagai
Silk cotton
Casuarina
Teak
Tamarind
Cashew
Amla
Pungan
Ailanthus
Red sanders
Jatropha
Acha
Subabul
Bamboo
Velvel
Karuvel
Konnai</td></tr>
<tr><td>2</td><td>Deputy Conservator of Forests,
Industrial Wood Research Division, Trichy.</td><td>81500</td></tr>
<tr><td>3</td><td>Deputy Conservator of Forests,
Minor Forest Produce Research Division,
Salem.</td><td>177950</td></tr>
<tr><td>4</td><td>Divisional Forest Officer,Modern Nursery
Division,Dharmapuri</td><td>92200</td></tr>
</table>

The Research wing supported Comprehensive Wasteland Development Programme during 2001-03 by supplying Agro forestry seedlings, Vermicastings and VAM. This was continued during 2003-04 also and the seedlings were supplied to the following districts.

Sl. No.	Name of District	No. of Seedlings
1	Dharmapuri	46000
2	Villupuram	24200
3	Cuddalore	22000
4	Karur	1500
5	Tiruvallore	15000
6	Pudukottai	30000
7	Tiruchy	50000
8	Namakkal	85000
9	Vellore	92950
	Total	**366650**

II. Trainings, Workshops & Exhibitions

A technical workshop was conducted at State Forestry Research Institute for the field staff namely Rangers and Foresters to impart training on Tamilnadu Afforestation Programme (TAP) during April, 2004 and January, 2005.

Presentations on important required thrust areas such as Tree improvement - Genetic combing, Post harvest technology, Soil Management practices etc, were delivered by various resource persons.

An exhibition was conducted by the Forest Utilization wing depicting various research activities of research wing. In the India Tourist and Industrial Fair 2004-05 conducted at Island Ground, Chennai from December, 04 to June, 05 with the theme of (Tourism - Driving force for poverty alleviation job creation and social harmony. Construction of Forest Department float in connection with Republic Day celebrations 2004 with the theme of rejuvenating people and wildlife was also done.

Annexures

ANNEXURE - I

LIST OF MEDICINAL PLANTS AT ALIYAR RESEARCH CENTRE

Sl. No.	Botanical Name	Family	Tamil Name/common Name
1.			Vishamurichan pachai
2.	*Abrus precatorius* L.	Fabaceae	Kunrimani, Kundumani
3.	*Abutilon indicum* (L.) Sweet	Malvaceae	Thuthi, Thuththi
4.	*Acacia caesia* (L.) Willd.	Mimosaceae	Mul
5.	*Acacia leucophloea* (Roxb.) Willd.	Mimosaceae	Velvel, Velvelam
6.	*Acacia nilotica* (L) Willd ex Del. Sub sp. indica (Benth.) Brenan	Mimosaceae	Karuvel, Karuvelam
7.	*Acacia sinuata* (Lour.) Merr. (=Acacia concinna (Willd) DC.)	Mimosaceae	Seegakai, Shivakkai
8.	*Acalypha betulina*	Euphorbiaceae	Siru chinni
9.	*Acalypha fruticosa* Forssk.	Euphorbiaceae	Chinni thazhai
10.	*Acalypha indica* L.	Euphorbiaceae	Kuppai meni
11.	*Achillea millefolium*	Compositae	Arrow
12.	*Achras sapota*	Sapindaceae	Sapota
13.	*Achyranthes aspera* L.	Amaranthaceae	Nayuruvi
14.	*Acorus calamus* L.	Araceae	Vasambu
15.	*Adathoda bedomii* (C.B.Clarke.) Bennet	Acanthaceae	Cinna ada thodai
16.	*Adathoda zeylanica*	Acanthaceae	Adathodai
17.	*Adenanthera pavoniana* L.	Mimosaceae	Aanai kunrimani
18.	*Aegle marmelos* (L) Correa	Rutaceae	Vilvam
19.	*Aerva lanata* (L) Juss. ex Schultes	Amaranthaceae	Siru pulai
20.	*Agave cantula* Roxb. (=Agave americicana auct non L.)	Agavaceae	Aanai katrazhi
21.	*Albizia amara* (Roxb.) Boivin	Mimosaceae	Unjal, Wonja, Usil
22.	*Albizia lebbeck* (L.) Willd.	Mimosaceae	Vagai, Konna
23.	*Allium cepa* L.	Alliaceae	Vengaiam
24.	*Allium sativum* L.	Alliaceae	Vellai poondu
25.	*Alocasia indica* (Roxb) Schott.	Araceae	Sepankizhangu
26.	*Aloe barbadensis*	Liliaceae	Katrazhai
27.	*Aloe vera* (L) Burm. f.	Liliaceae	Sotru katrazhai
28.	*Alpinia calcarata Roscoe* (= Alpinia galanga)	Zingiberaceae	Sitrarathai
29.	*Alstonia scholaris* (L.) R.Br.	Apocynaceae	Eazhilai palai

Sl. No.	Botanical Name	Family	Tamil Name/common Name
30.	*Alstonia venenata* (L.) R.Br.	Apocynaceae	Analivegam
31.	*Alternanthera sessilis* (L) R.Br. ex DC.	Amaranthaceae	Ponnanganni
32.	*Amaranthus* sp.	Amaranthaceae	Thandan keerai
33.	*Amaranthus spinosus* L.	Amaranthaceae	Mullu keerai
34.	*Amaranthus tristis*	Amaranthaceae	Araikeerai
35.	*Anacardium occidentale* L.	Anacardiaceae	Munthuri
36.	*Anacylus pyrethrum*	Compositae	Akkarakaram
37.	*Anamirta cocculus* (L.) Wight & Arn.	Menispermaceae	Kakkaikolli
38.	*Andrographis macrobotrys Nees*	Acanthaceae	Periya nangai
39.	*Andrographis paniculata* (Burm .f.) Wall. ex Nees	Acanthaceae	Siriyanangai
40.	*Anisochilus carnosus* (L.f.) Wall ex Benth	Lamiaceae	Karpura valli
41.	*Anisomeles malabarica* (L) R.Br. ex Sims.	Lamiaceae	Peyi Miratti, Nari Mirati
42.	*Annona squamosa* L.	Annonaceae	Seetha
43.	*Areca catechu* L.	Arecaceae	Paaku
44.	*Argemone mexicana* L.	Papavaraceae	Pirama thandu
45.	*Aristolochia bracteolate* Lam.	Aristolochiaceae	Aadu thinna palai
46.	*Aristolochia indica* L.	Aristolochiaceae	Easwara mooli
47.	*Artabotrys hexapetalus* (L.f.) Bhandari. (=Artobotrys odoratissimus R. Br.)	Annonaceae	Manoranjitham
48.	*Artemisia nilagirica* (C.B.Clarke.) Pamp.	Asteraceae	Masipachai
49.	*Artemisia parviflora* Buch-ham. ex D.Don	Asteraceae	Pachai
50.	*Artemisia sieversiana* Ehrh. ex Willd.	Asteraceae	Mari kozhundhu
51.	*Artemisia vulgaris*	Asteraceae	Masipathri
52.	*Artocarpus heterophyllus* Lam. (=Artocarpus integrioflia auct.non. L.f.)	Moraceae	Pala
53.	*Arundo donex* L.	Poaceae	Seenali
54.	*Asclepias curassiavica* L.	Asclepiadaceae	Kuruvapu
55.	*Asclepias sp.*	Asclepiadaceae	Visha kadi ver
56.	*Asparagus racemosus* Willd.	Liliaceae	Sathavari
57.	*Aystasia gangetica*		Silanthi Nayakam
58.	*Azadirachta indica* A.Juss.	Meliaceae	Vembu
59.	*Azima tetracantha*	Salvadoraceae	Sangam (Mul Sangam)

Sl. No.	Botanical Name	Family	Tamil Name/common Name
60.	*Bacopa monnieri* (L) Pennell	Scrophulariaceae	Brahmi
61.	*Bambusa arundinaceae* (Retz.) Roxb.	Poaceae	Moongil
62.	*Bambusa bamboo*	Poaceae	Moongil
63.	*Basella alba L.*	Chenopodiaceae	Kodipasalai keerai, Pachani keerai
64.	*Bauhinia purpurea* L.	Caesalpiniaceae	Manthaarai
65.	*Begonia* sp.	Begoniaceae	Iratha suri
66.	*Benincasa hispida* (Thunb.) Corgn. (=Benincasa cerera Savi)	Cucurbitaceae	Poosani
67.	*Berberis tinctoria*	Berberidaceae	Cosikala
68.	*Bidens* sp.	Compositae	Bidens
69.	*Bixa orellana* L.	Bixaceae	Varagu manjal, Japhara
70.	*Blepharis maderospatensis* (L.) Heyne ex Roth. (=Blepharis boerhaviifolia Pers.)	Acanthaceae	Nethira poondu
71.	*Boerhavia diffusa* L.	Nyctaginaceae	Mookkirattai
72.	*Bryonia laciniosa*	Cucurbitaceae	Nethira poondu
73.	*Butea monosperma* (Lam.) Tank. (=Butea frondosa Koen.)	Fabaceae	Porusu
74.	*Buxus semperavirens*	Buxaceae	
75.	*Caesalpinia crista* L.	Caesalpiniaceae	Kzharchikai
76.	*Caesalpinia pulcherima* (L) Sw.	Caesalpiniaceae	Myil kondari
77.	*Caesalpinia sappan* L.	Caesalpiniaceae	Padangam, Patungam
78.	*Calamus rotang* L.	Arecaceae	Pirambu
79.	*Calendula officinalis*	Compositae	Calendula
80.	*Calophyllum inophyllum* L.	Clusiaceae	Pinnai
81.	*Calotropis gigantean* (L) R.Br.	Asclepideaceae	Erukku (Vellai Erukkalai)
82.	*Camellia sinensis* (L.) Kunte. (=Camellia thea Link)	Theaceae	Theyilai, Kattu thaeyilai
83.	*Canthium dicoccum* (Gartxn.) Teijsm. & Binn.	Rubiaceae	Eeruli
84.	*Canthium tetrandra*	Rubiaceae	Kaarai
85.	*Capparis zeylanica* L. (=Capparis horrida L. f.)	Capparaceae	Aathandam, Thondi
86.	*Capsicum americanus*	Solanaceae	
87.	*Capsicum frutescens* L.	Solanaceae	Milagai
88.	*Caralluma umbellata* Haw.	Asclepiadaceae	Kalli munaiyan

Sl. No.	Botanical Name	Family	Tamil Name/common Name
89.	*Cardiospermum halicacabum* L.	Sapindaceae	Mudakkathan
90.	*Carica papaya*	Cariaceae	Pappali
91.	*Carissa corandas* L.	Apocynaceae	Kala, Kila
92.	*Cassia alata* L.	Caesalpiniaceae	Seemai Agathi
93.	*Cassia auriculata* L.	Caesalpiniaceae	Aavaram, Avarai
94.	*Cassia fistula* L.	Caesalpiniaceae	Kondrai
95.	*Cassia italica* (Mill.) Lam. ex Andr.	Caesalpiniaceae	Nila Aavarai
96.	*Cassia nigricans* Vahl.	Caesalpiniaceae	Suriyanvanangi, Thozhukanni
97.	*Cassia obtusus* Roxb.	Caesalpiniaceae	Nila vagai
98.	*Cassia senna* L.	Caesalpiniaceae	Tirunelveli senna, Nilavarai
99.	*Cassia sophera* L.	Caesalpiniaceae	Siru porumbi, Ponnavarai
100.	*Cassia tora*	Caesalpiniaceae	Siruporumbi
101.	*Catheranthus rosus* (L.) G.Don. (= Vincarosea	Apocynaceae	Nithiya kalyani
102.	*Centella asiatica* (L) Urban		Umbelliferae Vallarai
103.	*Chamomaelum nobile*	Compositae	Chamomaelum
104.	*Chrysanthemum cinerarifolium*	Compositae	Pyrathirum
105.	*Chyrsanthemum vulgaris*	Compositae	Fever few
106.	*Cichorium intybus* L.	Asteraceae	Kasini keerai
107.	*Cineraria martima*	Compositae	Silver Rag Wort, Dusty miller
108.	*Cinnamomum verum* Presl. (=Cinnamomum zeylanicum Blume)	Lauraceae	Ilavangam
109.	*Cissampelos pareira* L.	Menispermaceae	Pon muchutai
110.	*Cissus quadrangularis* L.	Vitaceae	Pirandai, Pexandai
111.	*Citrullus colocynthis* (L) Schradex	Cucurbitaceae	Aatru thummatti
112.	*Citrus medica* L.	Rutaceae	Elumichai
113.	*Clausena dentata* (Willd.) M. Roem. (=Clausena willdenovii Wight & Arn.)	Rutaceae	Kaatu kruveppalai
114.	*Cleistanthus collinus* (Roxb.) Benth.	Euphorbiaceae	Oduvam
115.	*Cleodendrum inermi* (L) Gaertn.	Verbenaceae	Peechankan
116.	*Cleome gynandra* L. (=Gynandropsis pentaphylla (L.) DC)	Cleomaceae	Nalvelai
117.	*Cleome viscose* L.	Cleomaceae	Nai velai

Sl. No.	Botanical Name	Family	Tamil Name/common Name
118.	*Clerodendrum phlomidies* L.f.	Verbenaceae	Thazhu thazhai
119.	*Clitoria ternatea* L.	Fabaceae	Sangu pushpam
120.	*Coccinia grandis* (L.) Vaigt	Cucurbitaceae	Kovai
121.	*Coccinia* sp.	Cucurbitaceae	Appa kovai
122.	*Coccinia viradis* L.	Cucurbitaceae	
123.	*Cocculus hirsutus* (L.) Diels.	Menispermaceae	Kaatu kodi
124.	*Coffea arabica* L.	Rubiaceae	Kaapi
125.	*Coix lacrymajobi* L. (free amino acid)	Poaceae	Nel pavazham
126.	*Coleus forskolii*	Lamiaceae	
127.	*Colocasia esculenta* (L.) Schott.	Araceae	Sembu
128.	*Colocasia tuber* (L.) Schott	Araceae	Paal sembu
129.	*Commelina benghalensis* L.	Commelinaceae	Kaana vazhai
130.	*Corchorus trilocularis* L.	Tiliaceae	Punnaku poodu
131.	*Coscinium fenestratum* (Gaertn.)Coleb.	Menispermaceae	Mara manjal
132.	*Costus speciosus* (Koen.) J.E.Smith	Costaceae	Naatu koshtam
133.	Crataeva adanonii sub.sp. odora (Buch.-Harm)Jacobs (=Crataeva religiosa sensu Dunn.)	Capparaceae	Maavilangam
134.	*Crinum latifolium* L.	Amaryllidaceae	Visha moongil
135.	*Crotalaria pallida* Dryand. (=Crotalaria striata DC.)	Fabaceae	
136.	*Crotolaria laburnifolia* L.	Fabaceae	Kizhukilupai
137.	*Croton bonplandianum* Baill. (=Croton sparsiflorus Morong)	Euphorbiaceae	Milagai poondu
138.	*Cryptolepis buchananii* Roem. & Schultes	Asclepideaceae	Krishna palai or kurudapalai
139.	*Cuppenia arundanaria*		
140.	*Curculigo orchiodes* Gaertn.	Hypoxidaceae	Nila panai
141.	*Curcuma angustifolia*	Zingiberaceae	Koogai kizhangu
142.	*Curcuma aromatica*	Zingiberaceae	Kasthuri manjal
143.	*Curcuma longa* L.	Zingiberaceae	Manjal
144.	*Cymbopogan flexuosus* (Nees ex Stued) Wats. (=Andropogon citrates Roxb.)	Poaceae	Karpoora pul.
145.	*Cymbopogon martini* (Roxb.) Wats. (=Andropogon martini Roxb. (=Vetiveria zizanioides (L.) Nash.))	Poaceae	Vettiver

Sl. No.	Botanical Name	Family	Tamil Name/common Name
146.	*Cynodon dactylon* (L.) Pers.	Poaceae	Arugu, Arugambul
147.	*Cynoglosum forgattum*	Poaceae	Kakkathalai
148.	*Cyphomandra betacaa*	Solanaceae	Tree Tomato
149.	*Dalbergia latifolia* L.	Fabaceae	Rosewood
150.	*Dalbergia sissoo*	Fabaceae	Thodagathi
151.	*Datura metal* L.	Solanaceae	Karu Oomathai
152.	*Datura stramonium*	Solanaceae	Thorn apple
153.	*Decalepis hamiltonii Wight* & Arn.	Periplocaceae	Magani kizhangu
154.	*Delonix elata* (L.) Gamble	Caesalpiniaceae	Vatha narayanan
155.	*Dendrocalmus strictus* (Roxb.) Nees	Poaceae	Kalmoongil
156.	*Denothera biennis*	Onagraceae	Evening primrose
157.	*Derris indica*	Papilonaceae	Pungan
158.	*Desmodium* sp.	Fabaceae	Chithamalli
159.	*Dichrostachys cinerea*	Leguminosae	Vidather
160.	*Digitalis purpurea*	Scropaularaceae	Fox clove
161.	*Dioscorea* sp.	Dioscoreaceae	Vettrialaipalli
162.	*Diplocyclos palmotus* (L.) Jeffrey	Cucurbitaceae	Ivirali
163.	*Dodonea viscose*	Sapindaceae	Virali
164.	*Ealeis guinensis*	Arecaceae	
165.	*Eclipta prostata* (L) L.	Asteraceae	Karisilanganni
166.	*Elaegnus conferta*	Eleagnaceae	Korangu pazham
167.	*Elephantophus sacber*	Asteraceae	Aanaiveratti
168.	*Elettaria cardamomum* L.	Zingiberaceae	Ealam
169.	*Emilia sonchifolia* (L) DC.	Asteraceae	Seedevi senkali neer
170.	*Enecostermia axillare* (Lam.) Raynal (=Enicostemma littorale auct non. Bl)	Gentianaceae	Vellarugu
171.	*Ensete superbum* (Roxb.) Cheesman	Musaceae	Malai vazhai
172.	*Erythrina superosa* Roxb.	Fabaceae	Kalyana murungai without thorns
173.	*Erythrina variegata* L. (=Erythrina indica Lam.)	Fabaceae	Mul murungai with thorns
174.	*Eucalyptus sp.*	Myrtaceae	Eucalyptus
175.	*Euphatorium glandulosum*	Asteraceae	Kari kattan
176.	*Euphorbia cyathophora* Murr. (=Euphorbia heterophylla sensu. Gamble)	Euphorbiaceae	Pal perukki

Sl. No.	Botanical Name	Family	Tamil Name/common Name
177.	*Euphorbia hirta* L.	Euphorbiaceae	Amman Pacharisi
178.	*Euphorbia nivulia Buck*-Ham.	Euphorbiaceae	Kalli, Naga kalli
179.	*Evolvulus alsinoides* (L.) L.	Convolvulaceae	Vishnu Gandhi
180.	*Ficus benghalensis* L.	Moraceae	Alamaram
181.	*Ficus carica* L.	Moraceae	Simai athi
182.	*Ficus microcarpa*	Moraceae	Kal all
183.	*Ficus racemosa* L. (=Ficus glomerata Roxb.)	Moraceae	Athi
184.	*Ficus religiosa* L.	Moraceae	Arasu
185.	*Ficus retusa* L.	Moraceae	Kal athi
186.	*Filicium dicipiens* (Wight & Arn.) Thw.	Sapindaceae	Aathu varai
187.	*Fragaria* sp.	Rosaceae	Garden strawberry
188.	*Fragaria vesca*	Rosaceae	Wild Strawberry
189.	*Garcinia gummigutta* (L) Robs	Clusiaceae	Kodam puli
190.	*Gardenia argustata* Merr. (=Gardinia jasminoides Ellis)	Oleaceae	Teekamalli
191.	*Gaultheria fragrantissima*	Ericaceae	Gaultheria
192.	*Gendarussa vulgaris* Nees (Justicia gendurosa Burm.f.)	Acanthaceae	Karu nochi
193.	*Glinus latoides* L.	Molluginaceae	Seruppadai
194.	*Gloriosa superba* L.	Liliaceae	Kanthanmalar
195.	*Glycosmis pentaphylla* (Retz.) DC.	Rutaceae	Konji
196.	*Gmelina arborea* Roxb.	Verbenaceae	Kumizh
197.	*Gossypium herbaceum* L.	Malvaceae	Sembarathi
198.	*Grewia tiliaefolia* Vahl.	Tiliaceae	Thadasu
199.	*Gymnema sylvestre* (Retz.) R.Br.ex Schultes	Asclepiadaceae	Siru kurinja
200.	*Hedyotis puberula* G.Don. Arn. (Oldenlandia umbellate L.)	Rubiaceae	Inpura
201.	*Helichrysum aurinarium*	Compositae	Everlasting flower
202.	*Helicteres isora.* L.	Sterculiaceae	Valamburi
203.	*Heliotropium indicum* L.	Boraginaceae	Thel kodukku
204.	*Hemidesmus indicus* (L) R.Br.	Periplocaceae	Nannari
205.	*Hemigraphis colorata*	Acanthaceae	Muri Kootti
206.	*Hibiscus cannabinus* L.	Malvaceae	Pulicha keerai
207.	*Hibiscus rosa sinensis* L	Malvaceae	Sempurathi

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208.	*Hibiscus sabdariffa* L.	Malvaceae	Pulichai keerai
209.	*Hibiscus viltifolius* L.	Malvaceae	Manjal thuththi
210.	*Hybanthus ennaespermus* (L.) F.E.Muell. (Ionodium sufruticosum (L.) Ging.)	Violaceae	Orithal thamarai; Orilai thamarai
211.	*Hydnocarpus pentandra* (Buch. Ham.) O.Ken (=Hydnocarpus Wightiana Blume)	Flacourtiaceae	Maravettai
212.	*Hygrophilla auriculata* (Schum) Heine	Acanthaceae	Neer Mulli
213.	*Hyptis suaveolens* (L.) Poit.	Lamiaceae	
214.	*Impatiens balsamina* L.	Balsaminaceae	Orithaz thamarai, Balsam
215.	*Indigofera aspalathoides* Vahl ex DC.	Fabaceae	Sivanar vembu
216.	*Indigofera tinctoria* L.	Fabaceae	vurineevi
217.	*Indoneesiella echioides* (L) Sreemadh. (=Andrographis echioides (L) Nees)	Acanthaceae	Gopuram thaangi
218.	*Ipomea obscura* (L) Ker. Gawl	Convuleaceae	Thalli keerai
219.	*Ipomoea batatas* (L.) Lam.	Convolvulaceae	Seeni vazhai, Sakkarai valli
220.	*Ipomoea perscapre* (L.) R.Br. (=Ipomea biloba Forssk.)	Convuleaceae	Muyatkathilai
221.	*Ipomoea quamoclit.* L. (=Quomoclit pinnata (Desx.) Boj.	Convoluvlaceae	Mayir manickam
222.	*Jasminum sambal*	Oleaceae	Malligai
223.	*Jasminum* sp.	Oleaceae	Pichipu
224.	*Jatropha curcus* L.	Euphorbiaceae	Katta aamanaku
225.	*Jatropha gossipifolia* L.	Euphorbiaceae	Sevva mankku
226.	*Justicia adhatoda* L. (=Adhatoda vasica Nees)	Acanthaceae	Aada tho dai
227.	*Kalanchoe pinnata* (Lam.) Pers. (=Bryophyllum pinnatum (Lam.) O.Ken)	Crassulaceae	Ranakalli
228.	*Kedrostis foetidissima* (Jacq) Cogn. (=Kedrosris rostrata (Rottl.) Cogn.)	Cucurbitaceae	Appa kovai
229.	*Lagenaria vulgaris* Ser.	Cucurbitaceae	Suraikodi
230.	*Lavender angustifolia*	Libiatae	Lavender
231.	*Lawsonia inermis* L.	Lythraceae	Maru thondri
232.	*Leotodon hispida*	Compositae	Rough hawkbit
233.	*Leptadenia reticulata* (Retz) Wight & Arn.	Asclepiadaceae	Palai kodi

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234.	*Leucas aspera* (Willd) Link	Lamiaceae	Thumbai
235.	*Leucas martimicensis*	Lamiaceae	Peru thumbai
236.	*Limonia acidissima* L. (=Ferronia elephantum Correa)	Rutaceae	Vila
237.	*Lippia citriodora*	Verbanaceae	Lippia
238.	*Lobella excelsa*	Companulaceae	Kattu pugaielai
239.	*Lobella nicotiana*	Companulaceae	Pugaielai
240.	*Ludwigia octovalvis* (Jacq.) Raven subsp. (Miq.) Raven	sessiliflora	Onagraceae Neer kirambu
241.	*Madhuca longifolia* (Koen.) Macbr. (Bassia longifolia Koen)	Sapotaceae	Naatu illupai
242.	*Madhuca longifolia* Koen. Macbr. var. latifolia (Roxb.) A. Cheval. (=Bassia latifolia Roxb.)	Sapotaceae	Kaatu Illupai
243.	*Majorna hortensis Moench*	Lamiaceae	Marugu
244.	*Mangifera indica* L. (=Bassia latifolia Roxb.)	Anacardiaceae	Maa
245.	*Manipot esculenta* Crantz.	Euphorbiaceae	Valli kizhangu, Maravalli Kizhangu
246.	*Maranta arundiancea* L.	Marantaceae	Arurutha kizhangu, Arrow Root
247.	*Marsellia minuta*		Neer aria
248.	*Melia dubia* Cav.	Meliaceae	Malai vembu
249.	*Mellingtonia hortensis* L.f.	Bignoniaceae	Mara valli
250.	*Memecylon edule* Roxb.	Melastomataceae	Kayambu
251.	*Mentha arvensis* L.	Lamiaceae	Puthina
252.	*Mentha citrata*	Lamiaceae	
253.	*Mentha piperata*	Lamiaceae	Kaatu puthina
254.	*Mentha sativa*	Lamiaceae	
255.	*Merremia tridentata* (L) Hall.f.	Convolvulaceae	Ammair kundal
256.	*Mesua ferrea* L.	Clusiaceae	Nangu
257.	*Mimosa pudica* L.	Mimosaceae	Thotta sinungi
258.	*Mirabilis jalaba* L.	Nyctaginaceae	Anthi malli
259.	*Mollugo cerviana* (L) Ser.	Aizoaceae	Parpadagam
260.	*Morinda pubescens* Juss. (=Morinda tinctoria Roxb.)	Rubiaceae	Nuna
261.	*Moringa pterigosperma* Gaertn. (=Moringa oleifera auct.non Lam)	Moringaceae	Murungai

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262.	*Mucuna pruriens* (L.) DC.	Fabaceae	Poonai kali kodi
263.	*Mukia maderaspatana* (L.) M.Roem.	Cucurbitaceae	Musu musukkai
264.	*Murdanjia glabra*		Seri pazham
265.	*Murdannia glauca* (Thuw.ex C.B.Clarke) Brueckner	Commelinaceae	
266.	*Murraya koenigii* (L.) Spreng.	Rutaceae	Karuveppilai
267.	*Musa paradisiaca* L.	Musaceae	Vazhai
268.	*Myristica dactylodies* Gaertn.	Myristicaceae	Jathikkai
269.	*Myristica fragrans* Houtt.	Myristicaceae	Adipalam
270.	*Myxopyrmum serrluatum* A.W. Hill	Oleaceae	Sadumulai
271.	*Nerium oleanderl* (=Nerium indicum Mill.)	Apocynaceae	Arali
272.	*Nilgirianthus ciliatus* (Nees.) Bresk.) (Strobilanthus ciliatus Nees.)	Acanthaceae	Karun kurinji
273.	*Notonia grandiflora* Wall ex DC.	Asteraceae	Mul kathu ilai
274.	*Nyctanthus arbortristis* L.	Nyctanthaceae	Pavazhamalli
275.	*Ocimum americanus* L.	Lamiaceae	Nai Thulasi
276.	*Ocimum basilicum* L.	Lamiaceae	Thiruneetru pachilai
277.	*Ocimum camphora* L.	Lamiaceae	Karpura thulasi
278.	*Ocimum gratissimum* L.	Lamiaceae	Rama tulasi
279.	*Ocimum kilimangaricum*	Lamiaceae	Kattu thulasi
280.	*Ocimum tenuflorum* L. (Ocimum sanctum L.)	Lamiaceae	Thulasi, Nalla thulasi
281.	*Olea dioica* Roxb.	Oleaceae	Kaatu malli
282.	*Oreganum vulgaris*	Libiateae	Oregnum
283.	*Origanum majorana*	Lamiaceae	Kamala valcoa, Marjoram
284.	*Oroxylum indicum* (L) Benth.ex kurz	Bignoniaceae	Perugu vagai
285.	*Oxalis corniculata* L.	Oxalidaceae	Puliyarai
286.	*Pachygone ovata* (Poir) Miers ex Hook.f. & Thoms.	Memspermaceae	Kattu kodi
287.	*Parimelia perlata*		Kalpasam
288.	*Passiflora edulis* Sims.	Passifloraceae	That put kodi
289.	*Passiflora foetida* L.	Passifloraceae	Poonai kodukan
290.	*Pavonia zeylanica* (L) Cav.	Malvaceae	Sittramuti; paramutti
291.	*Pedalium murex* L.	Pedaliaceae	Aanai neringi
292.	*Pelagonium graveolens*	Geraniaceae	Geronium

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293.	*Pergularia daemia* (Forssk.) . Chiov. (=Daemia extensa (Jacq.) R. Br	Asclepiadaceae	Veliparuthi
294.	*Petroselium crispum*	Umbeliferae	Parsley
295.	*Phyla nodiflora* (L.) Greene	Verbenaceae	Podu thalai
296.	*Phyllanthus amarus Schum.* & Thonn.	Euphorbiaceae	Keezhanalli
297.	*Phyllanthus emblica* L.	Euphorbiaceae	Nelli
298.	*Phyllanthus reticulates* Poir. (=Emblica officinalis Gaertn.)	Euphorbiaceae	Neer pulan
299.	*Phyllanthus* sp.	Euphorbiaceae	Mala nelli
300.	*Phytolocca* dioca	Phytolaccaceae	Kakka chedi
301.	*Piper longum* L.	Piperaceae	Thippili
302.	*Piper nigrum* L.	Piperaceae	Milagu
303.	*Plectranthus amboinicus* (Lour.) Spreng. (=Coleus amboinicus Lour) (=C. aromaticus Benth.)	Lamiaceae	Karpura valli
304.	*Plectranthus barbatus* Andr. (=Coleus barbatus (Andr). Benth)	Lamiaceae	
305.	*Plumaria alba*		Eethu senbagam
306.	*Plumbago indica* L.	Plumbaganaceae	Senkodi veli
307.	*Plumbago zeylanica* (L.)	Plumbaganaceae	Ven Kodivel
308.	*Pogostemon heyneanus* Benth. (=Pogostemon patchouli sensu Hook.f.)	Lamiaceae	Garuda pachi
309.	*Polygonum barbatum*	Polygalaceae	Aatru arali
310.	*Polygonum elongata* Klien ex Willd.	Polygalaceae	Periya nangai
311.	*Polygonum glabrum* Willd.	Polygonaceae	Akkarai Karam
312.	*Polygonum hydropiper*	Polygalaceae	Siriya nangai
313.	*Pongamia pinnata* (L) Piers.	Fabaceae	Pungan, Pongan
314.	*Portulaca oleracea* L.	Portulacaceae	Paruppu keerai
315.	*Pouzolzia zeylanica* (L) Benn. (=Pauzolzia indica (L.) Gaudich	Urticaceae	Kalurunji
316.	*Prosopis alba*	Mimosaceae	
317.	*Prunus qunegtalis*	Rosaceae	Badam parupu
318.	*Psidium guajava* L.	Myrtaceae	Koyya
319.	*Pterocarpus marsupium* Roxb.	Fabaceae	Vengai
320.	*Pterygota alata* (Roxb) R.Br. (Sterculia alata Roxb)	Sterculiaceae	Kudirai thondi

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321.	*Punica granatum* L.	Punicaceae	Maathulai
322.	*Quomoclit pinnata*	Convolvulaceae	Mayir manickam
323.	*Rauvolfia serpentina* (L) Benth.ex kurz.	Apocynaceae	Sarpagantha
324.	*Rauvolfia tettraphylla* L.	Apocynaceae	Pambu kala
325.	*Rhicanthus nasuitus* (L) Kunz.	Acanthaceae	Ariya nangai
326.	*Rhodomyrtus tomentosa*	Myrtaceae	Thavattu chedi
327.	*Ricinus cummunisa*	Euphorbiaceae	Amanakku
328.	*Rosa damascena* Mill.	Rosaceae	Roja
329.	*Rosmarium officinalis*	Rosaceae	Rosemary
330.	*Rubia cordifolia*	Rubiaceae	Manjista
331.	*Rubus ellipticus*	Rosaceae	Mul pazham
332.	*Rubus idaecus*	Rosaceae	Cap Gooseberry
333.	*Ruta chalapensis* (Ruta graveolens L. var. angustifolia. Hook)	Rutaceae	Aruvadha
334.	*Saccharum spontaneum* L.	Poaceae	Chinali (Nanal)
335.	*Salvadora persica* L.	Salvadoraceae	Kalarvagai
336.	*Salvia officinalis* L.	Lamiaceae	Sage
337.	*Sansvieria roxburghiana* Schultes & Schultes f.	Agavaceae	Uruvanthandu
338.	*Sansvieria thyrsiflora* Thumb.	Agavaceae	Thatai
339.	*Santalum album* L.	Santalaceae	Santhanam
340.	*Santolina chaemacyperissus*	Compositae	
341.	*Sapindus emarginatus* Vahl.	Sapindaceae	Poochai
342.	*Sapindus laurifolia* Vahl.	Sapindaceae	Poochai vagai
343.	*Saraca asoka* (Roxb.) Wilde	Caesalpiniaceae	Asoka
344.	*Sarcostemma acidum* (Roxb.) Voigt (Sarcostemma brevistigma Wight & Arn)	Asclepiadaceae	Aatpankodi
345.	*Sauropus androgynus* (L) Merr.	Euphorbiaceae	Thavasu murungai
346.	*Scilla hyacinthin* (Roth) Macbr. (Scilla indica (Wight) Baker)	Liliaceae	Kattumulli
347.	*Scoparia dulcis* L.	Scrohulariaceae	Sarakothi
348.	*Sesbania grandiflora* (L) Poir.	Fabaceae	Agathi
349.	*Sesbania sesban* L. Merr. (Sesbania aegyptica Poir) Pers)	Fabaceae	Siddhagathi
350.	*Sida acuta Burm* f.	Malvaceae	Arival manai poondu

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351.	*Sida cordata Burm*.f. Borssum	Malvaceae	Pazham pasi;
352.	*Sida rhombifolia* L. (Sida rhomboidea Roxb. ex Fleming)	Malvaceae	Arival Mooku
353.	*Simarouba glauca*	Simaroubaceae	Sokkamaram
354.	*Smilax aspera* L.	Liliaceae	Parangai Chakkai
355.	*Solanum dulcamara* L.	Solanaceae	Kattu thakkali
356.	*Solanum nigrum* L.	Solanaceae	Manath thakkalai
357.	*Solanum pubescens* Willd.	Solanaceae	Malai sundai
358.	*Solanum* Sp.	Solanaceae	Malai kathiri
359.	*Solanum torvum* Sw.	Solanaceae	Sundai
360.	*Solanum trilobatum* L.	Solanaceae	Thoodhu valai
361.	*Solanum viriginianum* L. (=Solanum jacquinii Willd.) (= Solanum surratense Burm.f.)	Solanaceae	Kandan kathiri; Mullu kathri
362.	*Spathodia companulata*		Neer peechi
363.	*Spermacoce hispida* L.	Rubiaceae	Nathaisoori
364.	*Sphaeranthus indicus* L.	Asteraceae	Kottai karanthai
365.	*Spilanthes calva DC.* (Spilanthus acmila auct.non (L.) Murr.)	Asteraceae	Palvali poondu
366.	*Stachytarpheta urticaefolia* (Salisb.) Sims. (=Stachytarpheta indica auct.non (L) Vahl.)	Verbenaceae	Ezhuthani poondu
367.	*Strychnos nux vomica* L.	Loganiaceae	Etti
368.	*Syzygium aromaticum* (L.) Merr.& Perry (=Eugenia caryopayllata Thumb)	Myrtaceae	Kirambu
369.	*Syzygium cumini* (L) Skeels	Myrtaceae	Naval
370.	*Tabernaemontana divaricata* (L.) R.Br. ex Roem. & Schultes (=Taberna emon tana coronaria (Jacq.) Willd.	Apocynaceae	Nanthiya vattai
371.	*Tagates minutiae*	Asteraceae	Tagetas
372.	*Talinum portulacifolium* (forsk.) Asch. & Schweinf. (=Talinum cuneifolium (Vahl) Willd.)	Portulacaceae	Parupu keerai
373.	*Tamarindus indica* L.	Caesalpiniaceae	Puli
374.	*Tectona grandis* L.f.	Verbenaceae	Thekku
375.	*Terminalia arjuna* (Roxb.ex DC) Wight& Arn.	Combertaceae	Maarutha maram
376.	*Terminalia arjuna* (Roxb.exDC.) Wight & Arn.	Combretaceae	Marudhi

Sl. No.	Botanical Name	Family	Tamil Name/common Name
377.	*Terminalia bellarica* (Gaertn.) Roxb.	Combertaceae	Thaani
378.	*Terminalia catappa* L.	Combertaceae	Yaadham
379.	*Terminalia chebula* Retz.	Combertaceae	Kadukkai
380.	*Thespesia populneoides* (Roxb.) Kastel. (=Thespesia populnea sensu Mast.)	Malvaceae	Poovarasu
381.	*Thymus seriphyllum*	Leguminosae	Wild thyme
382.	*Thymus valgaris*	Leguminosae	Thyme
383.	*Tinospora cordifolia* (Willd.) Miers.ex Hook.f. & Thoms.	Menispermaceae	Seenthil
384.	*Titchnia diversifolia*		Chandrakantha
385.	*Toddalia aculata* (L.) Lam.	Rutaceae	Kattu milagu
386.	*Toddalia asiatica* (L.) Lam.	Rutaceae	Mila garanai
387.	*Tradiscansiliya virginiana*	Commelinaceae	Tradiscansiliva
388.	*Traxacum officinale*	Compositae	Dandelion
389.	*Trianthema decandra* L.	Aizoaceae	Sathi saranai
390.	*Tribullus terretris* L.	Zygophyllaceae	Nerunjil
391.	*Tridax procumbens* L.	Asteraceae	Kinatru paasan
392.	*Trigonella foenumgraecum* L.	Fabaceae	Venthayam
393.	*Tropaeolum majus*	Nustraceae	Vustrum
394.	*Tylophora indica* (Burm.f.) Blume	Asclspidaceae	Valli palai
395.	*Typhonium trilobatum*	Araceae	Karunai kizhangu
396.	*Ulex europaeus* L.	Fabaceae	Panni mullu
397.	*Urginea indica* (Roxb.) Kunth	Liliaceae	Kaatu ulli
398.	*Urginea indica* Roxb. Kunth.	Liliaceae	Kattu ulli
399.	*Valerian officinalis*	Valerianaceae	Valerian
400.	*Vinca* sp.	Apocynaceae	Madagascar periwinkle
401.	*Viola oclaratta*	Violaceae	
402.	*Viola suffruticosa*	Violaceae	Orithaz thamarai
403.	*Vitex leucoxylon* L.f.	Verbenaceae	Neer nochi
404.	*Vitex negundo* L.	Verbenaceae	Nochi
405.	*Withania somnifera* (L) Dunal	Solanaceae	Amukraan
406.	*Wrightia tinctoria* (Roxb) R.Br.	Apocynaceae	Veppalai
407.	*Zehneria scabra* (L.f.) Sond.	Cucurbitaceae	Aagasa garudan
408.	*Zingiber officinale* Roscoe	Zingiberaceae	Inji
409.	*Ziziphus mauritiana* Lam. (=Zizyphus jujuba (L) Gaertn.)	Rhamnaceae	Elanthai

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410.	*Zizyphus oenoplia* (L.) Mill.	Rhamnaceae	Suri
411.	*Zizyphus xylophyrus* (L.) Lam.	Rhamnaceae	Kottai elanthai
Species added during 03-04			
412.	--	--	Santhanakarani
413.	--	--	Kattu Injii
414.	--	--	Kaumpirandai
415.	*Euphorbia tricalli*	--	Paachan
416.	--	--	Mul sangan
417.	--	--	Pon Arali
418.	--	--	Suguna
419.	--	--	Puli Nelli
420.	--	--	Fruit Kizangu
421.	--	--	Pulipirandai
422.	*Prosopis spicigera*	--	Vanni
423.	--	--	Vizhumbi
424.	--	--	Kadalai pazham
425.	--	--	Sai maram
426.	--	--	Mistai
427.	--	--	Pei kolli
428.	--	--	Kavilthumbai
429.	*Ocimum canum*	--	Kanjan korai
430.	*Helecteres isora*	--	Kalnar sedi
431.	*Tephrosia purpurea*	--	Kozhunji
432.	*Moringa pterygosperma*	--	Kattu murungai
433.	*Celastrus paniculatus*	--	Val uluvai
434.	*Cycus sirsanalis*	--	Madhana kamam
435.	*Saraca asoka*	--	Asoka
436.	*Caparis zeylanica*	--	Thoratti
437.	*Caesalpinia sappan*	--	Pathimugam
438.	*Culinia excelsa*	--	Vedipala
439.	*Bambusa polymorpha*	--	Moongil edible
440.	*Plumeria alba*	--	Eelathu alari
441.	*Plumeria rubra*	-	--

ANNEXURE - II
RESEARCH DIRECTORY OF HIGH YIELDING *JATROPHA CURCAS*

Sl. No.	Tree No.	Locality of Tree details	Oil % with respect	
			Whole seed gm	Endosperm gm
1.	1 to 3	Poola parathiyoor Ananmalai, Pollahi	Seed not received from the collector	
2.	4 to 3	Manjavadi SalemcAroorc Main Road	25.0 19.6	40.8 32.2
3.	14 to 17	Nochodai, Dindigul, Sebanstin Sasi, Sakthivel Garden	25.0	49.4
4.	18 to 22	Sevugampatti Near Bus Stop Sangarettikottai Via Vathalagundu	23.4	44.2
5.	23 to 25	Ayyappati Village Dindigual to Natham Road	26.2	43.0
6.	26 to 28	Fencing area of Arimalam (R) Centre	22.6	48.7
7.	29 to 30	Kadamangudi Thriuvidaimarthur 38 - Maharajapuram (Po)	Seed not received from the collector	
8.	31 to 33	Royavaram Near Anjaneyar Temple Pudukottai	30.2	51.2
9.	34 to 44	Kalathupatti Manjavadi Post Papparaooathi Taluk	24.0 32.7	41.7 53.4
10.	45	Appanthirupathi Pvt. Ltd Alapar Koil	29.5	49.8
11.	46 to 47 60, 71 73	Pochamaptti Near Graveyard	25.0	44.8
12.	48 to 50	Near Vinayakar E.B. Office, Vembapattai (Po), Dindigul - Kovilpatti Road	28.0	52.2
13.	51 to 52	Way to Thadiyankudisai Perumparai Meri Estate	26.3	51.1
14.	53 to 54	Near Pilliyar Temple Meenakshipuram Arimalam	29.5	50.8
15.	55 to 56	Near Manjior Bus Stop Manjior to Maylam Parai Road	29.9	46.6

Sl. No.	Tree No.	Locality of Tree details	Oil % with respect	
			Whole seed gm	Endosperm gm
16.	57	Near Bridge Vayaloor Kulumani Road	27.9	50.9
17.	58	Gunaseelam Musiri Road Near Temple	27.3	47.9
18.	59	Pothavoor Near (R) Gardern River bank	Seed not received from the collector	
19.	61 to 62	Ramakrishnan Garden Uthanappali Osur Taluk Dharmapuri District	36.6	59.6
20.	63 to 65	Muthniah Garden Shanma P.O Osur Taluk Dharmapuri District	30.8	54
21.	66 to 67	Koodathooki Kulasekaram Post Pechiparai adamasamoodu Post	32.3	52.0
22.	68 to 70	Madurai Goundanoor Alamaelupuram Pappareddi Taluk Dharmapuri District	Seed not received from the collector	
23.	72	Poonamaravathi - Panchayat Thoothoor - Achukkadu	Seed not received from the collector	

ANNEXURE - III
RESEARCH DIRECTORY OF TREE BORNE OIL SEEDS

Sl. No.	Name of species	Water pet Seed in Gm	Oil % wrt Seed Gm	Color of Oil	Odour
1.	*Acacia auriculiformis*	0.0225	4.75	Bright Yellow	No specific smell
2.	*Acacia leucopholea*	0.02416	4.14	Brownish yellow	Bad odor
3.	*Albizzia lebbeck*	0.1030	5.63	Greenish yellow	Bitter odor
4.	*Annona squamosa*	0.1854	15.77	Brown	Foul odor
5.	*Anogeissus latifolia*	0.005838	6.3	Pale yellow	No smell
6.	*Azodiracha indica*	0.1696	18.8	Bright yellow	Neem oil smell
7.	*Bauhinia racemosa*	0.1101	2.8	Green	Ground Nut Oil smell
8.	*Bridelia retusa*	0.0484	6.08	Greenish yellow	Bitter odor
9.	*Canarium stricturm*	8.3044	9.43	Blackish Brown	Foul odor
10.	*Cassia siamea*	0.0255	8.7	Dark greenish yellow	Bad odor
11.	*Ceiba pentandra*	0.0589	24.64	Yellow	Like that of caster oil
12.	*Cesalpia coriea*	1.3058	3.6	Greenish yellow	Bad odor
13.	*Dalbergia latifolia*	0.1065	3.5	Pale green	Like pungan oil
14.	*Delonix regia*	0.4418	6.81	Brown	Bad smell
15.	*Hardwickia binnata*	0.4281	9.81	Dark green	Bad odor
16.	*Jacaranda mimosifolia*	11.060	2.74	Slight green	Like neem oil
17.	*Leucaenea leucopholea*	0.05833	6.67	Greenish yellow	Bad odor
18.	*Melia dubia*	4.126	9.15	Brown	Neem oil smell
19.	*Pongamia pinnata*	3316	17.8	Yellow	Bitter odor
20.	*Stylosanthus hamata*	0.003038	7.4	Greenish yellow	Foul odor
21.	*Strychnosmix vomica*	1.7215	3.84	Pale yellow	Bad odor
22.	*Tamarindus indica*	0.8237	5.7%	Brown	Bitter odor
23.	*Tectona grandis*	0.7511	13.1	Red	Bad odor
24.	*Terminalia bellarica*	4.1793	37.5	Brown	Groundnut oil

Sl. No.	Name of species	Water pet Seed in Gm	Oil % wrt Seed Gm	Color of Oil	Odour
25.	*Thespesia populnea*	4.2706	14.01	Brown	Foul odor
26.	*Zizyphus jujube*	0.8961	4.29	Golden yellow	Bad odor
27.	*Eucalyptus tereticornis*	0.000496	193.4	Brown	Pleasant odor
28.	*Embalica officinalis*	0.1788	13.6	Yellow	Pleasant odor
29.	*Albizia amara*	0.7966	4.17	Reddish yellow	Pleasant odor
30.	*Eucalyptus citridora*	0.00694	16.8	Greenish yellow	Pleasant odor
31.	*Holopetelia integrifolia*	0.345	12.33	Yellow	Pleasant odor
32.	*Hopea wightiagiora*	16.679	2.82	Greenish yellow	No pleasant odor
33.	*Acacia nilotica*	0.1579	9.87	Blackish green	No pleasant odor
34.	*Acacia ferrogenia*	0.1539	6.08	Yellow	No pleasant odor
35.	*Wrightia tinctoria*	0.2676	30.04	Dark red	No pleasant odor
36.	*Kaya nayasica*	0.3835	51.36	Golden yellow	No pleasant odor
37.	*Mallotus philipensis*	0.0937	5.89	Greenish yellow	No pleasant odor

ANNEXURE - IV

OFFICERS WHO HELD THE POST OF CHIEF CONSERVATOR OF FORESTS (RESEARCH, EXTENSION & TRAINING)

CHIEF CONSERVATOR OF FORESTS	FROM	TO
M. Harikrishnan	01.09.90	30.11.1990
M. Harikrishnan*	01.12.90	31.03.1991
V. Jayaraman	04.06.91	30.06.1993
Rakesh Vasisht*	01.07.93	29.07.1993
S. Sankara murthy	30.07.93	02.11.1983
P.K. Ponnusamy	03.11.93	11.05.1994
C. Venugopal	12.05.94	31.10.1994
B. Arulprakasam	09.11.94	06.02.1995
P.K. Ponnusamy*	07.02.95	31.03.1995
P.K. Ponnusamy	01.04.95	30.10.1995
K. S. Dehal	01.11.95	19.06.1996
S. Shanmugasundaram*	20.06.96	30.11.1997
R. Sundaraju*	01.12.97	11.12.1997
Dr. G. Kumaravelu	12.12.97	19.02.2004
R. Sundaraju	20.02.04	17.02.2005

* Additional Charge.

THE POST WAS UPGRADED AS ADDITIONAL PRINCIPAL CHIEF CONSERVATOR OF FORESTS (RESEARCH) FROM 18.02.2005

Gautam Dey	18.02.2005	Till Date

OFFICERS WHO HELD THE POST OF STATE SILVICULTURIST / CONSERVATOR OF FORESTS, (RESEARCH)

STATE SILVICULTURISTS	FROM	TO
V.T.Barry	16.08.1919	04.02.1920
A.Wimbush	04.02.1920	05.02.1920
E.M.Crothers	05.02.1920	18.03.1920
Rao Sahib K.R.Venkataramana Iyer	19.03.1920	06.03.1921
W.C.Hart	07.03.1921	30.06.1921
Rao Sahib K.R.Venkataramana Iyer	01.07.1921	28.02.1922
J.M.Sweet	01.03.1922	09.10.1922
F.D.Ardagh	10.10.1922	09.11.1922
J.M.Sweet	10.11.1922	26.03.1925
J.D.Connolhy	28.03.1925	27.03.1928
AMC.Littlewood	28.03.1928	1930 - 1931
W.G.Dyson	1931 - 1932	1932 - 1933
M.V.Laurie	1932 - 1933	1933 - 1934

STATE SILVICULTURISTS	FROM	TO
A.L.Griffith	1934 - 1935	24.05.1939
M.S.Raghavan	25.05.1939	13.10.1939
A.L.Griffith	14.10.1939	05.12.1940
M.S.Raghavan	06.12.1940	05.07.1944
S.G.Venkataramanan	06.07.1944	20.08.1944
M.S.Raghavan	21.08.1944	20.06.1945
S.G.Venkataramanan	21.06.1945	20.07.1945
M.S.Raghavan	21.07.1945	10.06.1949
K.N.Raghavan Nair	11.06.1949	18.07.1949
M.S.Raghavan	19.07.1949	09.08.1949
K.N.Raghavan Nair	10.08.1949	19.12.1951
C.P.Bhimayya	21.10.1951	19.12.1951
K.M.Raghavan Nair	06.01.1952	05.08.1954
P.Venkataramani	06.08.1954	11.08.1958
E.S.Thangam	12.08.1958	02.11.1958
T.Achaya	03.11.1958	06.04.1960
A.Yegnasamy	07.04.1960	14.06.1962
G.J.Rajasingh	15.06.1962	30.09.1963
KPD.Rao	01.10.1963	30.12.1963
G.J.Rajasingh	31.12.1963	29.10.1965
A.M.Tholamani Devar	30.10.1965	23.09.1969
K.Thirumalai Raj	24.09.1969	11.09.1970
P.Bhaskara Doss	12.09.1970	01.10.1970
K.Thirumalai Raj	12.10.1970	07.06.1971
K.Shanmuganathan	08.06.1971	23.06.1971
K.R.venkatesan	24.06.1971	29.06.1971
M.Thyagarajan	30.06.1974	01.07.1977
P.K.Ponnusamy	01.07.1977	31.05.1979
A.M.Mohamed Hussian	01.06.1979	11.07.1979
S.Kondas	12.07.1979	29.09.1979
S.John Joseph	30.09.1979	05.10.1979

THE POST WAS UPGRADED AS CONSERVATOR OF FORESTS (RESEARCH) FROM 06.10.1979

CONSERVATOR OF FORESTS	FROM	TO
S.John Joseph	06.10.1979	20.10.1979
S.Kondas	21.10.1979	05.05.1981
G.J.Rajasingh	06.05.1981	06.09.1982
B.Arul Prakasam *	07.09.1982	12.09.1982
K.R.Venkatesan	13.09.1982	06.04.1984
B.Arul Prakasam *	07.04.1984	27.05.1984
C.Venugopal	28.05.1984	13.09.1984
S.Shanmugasundram	14.09.1984	06.05.1988
R.Sundararaju	07.05.1988	20.01.1990
K.K.Somasundram *	21.01.1990	14.02.1990
R.Sundararaju	15.02.1990	30.03.1990
V.R.Chitrapu *	31.03.1990	15.04.1990
R.Sundararaju	16.04.1990	18.05.1992
G.Kumaravelu	19.05.1992	22.09.1993

RESEARCH CIRCLE WAS DIVIDED INTO TWO RESEARCH CIRCLES AS RESEARCH EASTERN CIRCLE AND RESEARCH WESTERN CIRCLE WITH EFFECT FROM 23.09.93

CONSERVATOR OF FORESTS	FROM	TO
G.Kumaravelu	23.09.93	13.06.94
R.Gunasekran	19.06.94	06.01.95
Lakshmi Narayan	21.06.96	18.04.98
K.Chidambaram	19.06.96	18.04.98

CONSERVATOR OF FORESTS	FROM	TO
Rakesh Vasisht	23.09.93	21.06.96
R.Ganesan	06.01.95	19.06.96

THE RESEARCH CIRCLES WERE REORGANIZED INTO ONE CIRCLE WITH EFFECT FROM 19.04.1998

CONSERVATOR OF FORESTS	FROM	TO
Lakshmi Narayan	19.04.1998	31.05.1998
K.K.Chaudhuri	01.06.1998	15.05.2000
R.Ganesan*	19.05.2000	18.06.2000
K.K.Chaudhuri	19.06.2000	28.09.2000
V.Irulandi*	29.09.2000	22.10.2000

CONSERVATOR OF FORESTS	FROM	TO
K.K.Chaudhuri	23.10.2000	12.04.2001
V.Irulandi*	13.04.2001	12.05.2001
K.K.Chaudhuri	13.05.2001	25.07.2001
A.Samant Singhar*	26.07.2001	17.08.2001
P.A.Mani*	18.08.2001	06.09.2001
N.Krishna Kumar	07.09.2001	18.09.2005
V.Irulandi*	19.09.2005	11.10.2005
N.Krishna Kumar	12.10.2005	17.10.2005
H. Malleshappa	18.10.2005	Till Date

* Additional Charge.

STAFF STRENGTH IN RESEARCH CIRCLE, CHENNAI

Conservator of Forests	1
Deputy Conservator of Forests	6 (including FUO)
Assistant Conservator of Forests	1
Ranger	29
Foresters	54
Forest Guard	5
Forest watcher	3
Mali	45
Personal Assistant	1
Superintendent	6
Junior Assistant	15
Assistant	9
Steno typist	3
Typist	5
Driver	6
Office Assistant	25
Office Watchman	5
Photographer	1
Projector Operator	1
Chemist	1
Lab Assistant	3
Agriculture officer	2 (Deputation)
Research Assistant	1
Junior Draughting Officer	1
Draughting Officer	1
Total	237

LIST OF RANGERS, FORESTERS, FOREST GUARDS, FOREST WATCHERS AND MALIS DURING THE YEAR 2003-2004

RANGERS

1.	M. Dhanraj	13.	P.H. Raman	24.	D. Sadasivam
2.	V. Marimuthu	14.	R. Bheem Singh	25.	A.S. Mohanram
3.	M. Thirupathy	15.	V. Selvakumar	26.	D. Palanisamy
4.	R. Kulandaivelu	16.	K. Balraj	27.	K.R. Selvarajan
5.	S.M. Elumalai	17.	D. Rudhruppa	28.	V. Alagumalai
6.	P.R. Immanual	18.	D. Sivananthan	29.	K. Namachivayam
7.	T. Kaliamurthy	19.	V. Annamalai	30.	J.Irudaayraj
8.	E.V. Gnanaraj	20.	R. Rajendran		
9.	A. Anbu	21.	P.K. Udayakumar		
10.	A. Soundarrajan	22.	T. Vaithialingam		
11.	G. Shajahan	23.	T. Arikrishnan		

FORESTERS

1.	K. V. Noorbatcha	18.	M. Manickam	35.	S. Arjunan
2.	N. Natarajan	19.	K. Srinivasan	36.	H. Bellan
3.	Gurujan	20.	T. Kannan	37.	K. Beeman
4.	C. Rajendran	21.	N. Sakthivel	38.	M. Mohanram
5.	S. Santhakumar	22.	V. Gunasekaran	39.	M. Subramaniam
6.	V. Krishnan	23.	S. Shanmugam	40.	M. Raj
7.	D. Manoharan	24.	M. Anantha Nagaraj	41.	R. Subramaniam
8.	H.G. Chelladurai samuel	25.	K. Chinnaparaj	42.	R. Egambaram
9.	T. Raghupathy	26.	R. Mohan	43.	S. Kandaiah
10.	R. Vajravel	27.	P.V. Kuppusamy	44.	Palanisamy
11.	K. sundaramurthy	28.	N. Krishnamoorthy	45.	M. Murugan
12.	S. Chandran	29.	P. Kuppusamy	46.	R. Devarajan
13.	S.N. Rahuman	30.	P. Chinnadurai	47.	S.K. Dharamasamy
14.	L. Sundarajan	31.	S.E. Ranganathan	48.	T. Vijayakumar
15.	S. Amirtharaj	32.	A. Mohanasundaram	49	Manase Manavalan
16.	R. Chelladurai	33.	A.R. Subramanian		
17.	C.D. Basavaraj	34.	V. Sakthivel		

FOREST GUARD

1. A. Abubakkar siddiq
2. P. Perumal
3. E. Kanagaraj

FOREST WATCHER

1. Subramaniyan

MALI

1.	K. Pichaikaran	16.	S. Settu	31.	M. Settu
2.	B. Chinnaiyan	17.	M. Rajavel	32.	K. Karunakaran
3.	R. Manoharan	18.	N. Danapal	33.	P. Singaram
4.	K. Ramalingam	19.	A. Manickam	34.	V. Krishnasamy
5.	M. Palanisamy	20.	G. Kamaraj	35.	V. Avan
6.	P. Nallathambi	21.	C. Natarajan	36.	P. Shanmugam
7.	P. Ramasamy	22.	K. Perumal	37.	S. Subramani
8.	M. Elangovan	23.	P. Periyasamy	38.	R. Vediappan
9.	R. Srinivasan	24.	L. Karupannan	39.	C. Selvarayar
10.	M. Raman	25.	P. Sundaram	40.	A. Krishnan
11.	P. Parathesi	26.	K. Palanisamy	41.	R. Gunasekar
12.	P. Chinnakannu	27.	V. Subbarayan	42.	V. Arunachalam
13.	K. Thavasi	28.	M. Boopathy		
14.	K. Appu	29.	A. Kannan		
15.	N. Samikannu	30.	K. Thoppalan		

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Chief Conservator of Forests and Director
31 AUG 2006
TNFA, CBE-641 002.

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Tmt. P.S. Arulvadivu, B.Sc., (Agri)	Agricultural Officer, Coimbatore

All the Ministerial Staff (Research Circle)

All the Foresters (Research Circle)

All the Forest Guards, Malis & Plot Watchers (Research Circle)

Decaelepsis hamiltonil

Jatropha curcas (Oil yeilding)

Seed Storage

Biofertilizers

Bamboo Furnitures

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Chief Conservator of Forests and Director
31 AUG 2008
TNFA, CBE-641 002

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